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Prehistoric Land Use Patterns in Southeastern Montana

by James R. Wettstaed

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ABSTRACT

Over the past ten years, a substantial number of archaeological surveys have been conducted on the Ashland Ranger District of the Custer National Forest. The large number of archaeological sites recorded to date on the District provide an excellent data base from which to develop a model of the land use patterns of the previous inhabitants of the region. Once it is known where people lived in the past, it should then be possible to determine where archaeological sites should be located in the future. The distributions of all archaeological sites recorded on the Ashland District as of the summer of 1988 are used to develop a model of the distribution of archaeological sites on the District. Based on this model, predictions are made as to where sites should, and should not, be found by future surveys. These predictions are then tested using the results of a survey of 6,000 acres conducted in the fall of 1988. The model is shown to be partly successful, although in need of revision. Soil types and slope are the best predictors of site location on the District. The data obtained by this survey are then combined with those used to develop the predictive model to produce a model of land use patterns on the Ashland District. Changes over time are described and some preliminary hypotheses are presented to explain the patterns seen.

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CHAPTER 1

INTRODUCTION

One of the basic problems in archaeology is determining where people lived in the past and why they lived in that location (Gummerman 1971). Developing settlement pattern models is one of the first steps which has to be taken in order to understand the way in which a past population adapted to their environment - both natural and cultural. Once we know where people lived and why they lived there, it should be possible to make predictions as to where archaeological sites will be found (Plog and Hill 1971). The following study is an analysis of land use patterns on the Ashland Ranger District of the Custer National Forest, located in southeastern Montana (Fig. 1).

Over the past 15 to 20 years, there has been a tremendous increase in the amount of data which has been accumulated in southeastern Montana. Prior to 1970, archaeological research in the Pine Parklands was almost non-existent (exceptions to this include Bentzen 1962 and Frison 1970). This changed, however, after 1970. In the 1970's there was a great interest in developing coal mines in southeastern Montana, as in many parts of the West (Abbey 1977). As a result of new laws requiring a consideration of possible impacts to significant historic and prehistoric sites, this coal boom lead to the conducting of many archaeological surveys. These same laws also required the federal government to inventory its land prior to conducting ground disturbing activities. As a result, from approximately 1978 to the present time there has been an ongoing archaeological survey program carried out on

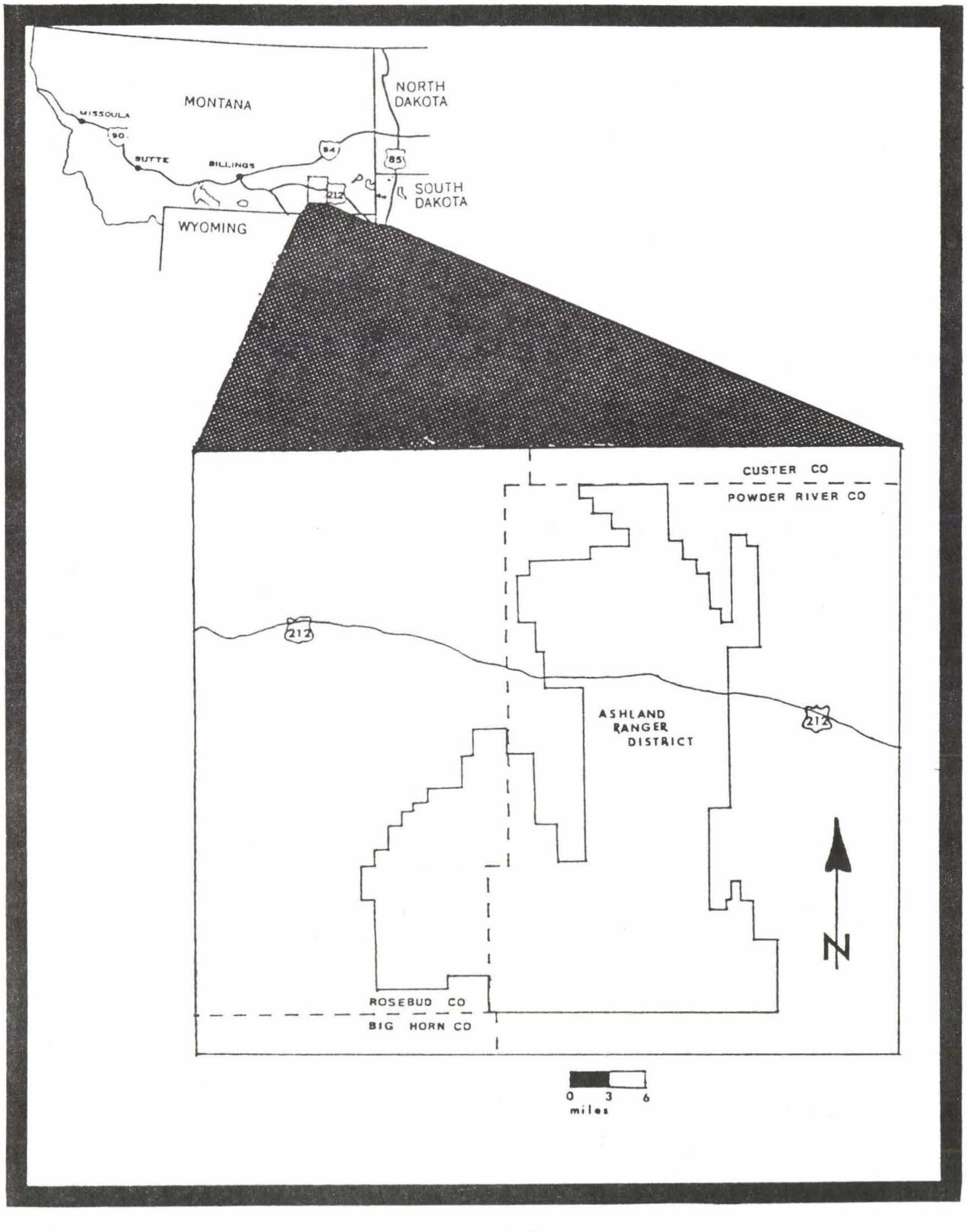

MONTANA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
MISSOULA
BUTTE
BILLINGS
90
94
85
212
CUSTER CO
POWDER RIVER CO
212
ASHLAND RANGER DISTRICT
212
N
ROSEBUD CO
BIG HORN CO
0
3
6
miles

FIGURE 1
Location of the Ashland Ranger District

the Ashland District of the Custer National Forest. The surveys conducted by the Forest Service have ranged in size from less than 10 acres to more than 6,000 acres in size. Of the roughly 450,000 acres contained within the borders of the Ashland District, approximately 37,000 have been inventoried. These surveys have recorded 589 sites.

The first surveys conducted on the Ashland District (Beckes 1976; 1978; McLean 1975; 1983) were in the nature of reconnaissance surveys carried out to determine the nature of the archaeological record on the District. These surveys located a total of 181 sites, and Beckes (1976; 1978) and McLean (1975; 1983) presented some hypotheses about the nature of the prehistoric record on the District. In 1983 a general overview of the Custer National Forest was published (Beckes and Keyser 1983). A primary purpose of this study was to provide a context against which to evaluate those sites located by surveys carried out on the Forest.

The fact remains, however, that the only detailed studies of site locations on the Ashland District (Beckes 1976; 1978; McLean 1975; 1983) were carried out 15 years ago, and there has been a tremendous increase in the number of recorded sites (roughly 400 sites) since that time. Almost all of these sites were located by small-scale surveys conducted prior to timber sales or the construction of range improvements in order to comply with Section 106 of the National Historic Preservation Act. These were not research oriented projects and the results of the various surveys were not compared. Sites located by these surveys were avoided by ground disturbing activities and no further investigation of the sites was usually conducted. As a result, a large body of data has been generated which has not been examined. In order to carry out a proper cultural resource management program it is necessary to evaluate each site in the context of what is already known about the region. The current study will update the work of Beckes (1976; 1978) and McLean (1975; 1983) and provide that context.

It should be noted that in 1988 the Miles City District of the Bureau of Land Management completed a Class I overview (Deaver and Deaver 1988), similar to that of Beckes and Keyser (1983), for the area administered by that office. This overview covers almost all of eastern Montana, including the Ashland District, and is intended to provide background information for evaluating site significance and for developing research designs. The present study examines a much smaller study area than the Miles City District overview and can be seen as complimentary to that report.

A secondary goal of this study is to develop a predictive model for site locations on the Ashland District. This will be done using the results of the study of site distributions on the District. Predictive models are being used with increasing frequency in cultural resource management (Kohler and Parker 1986). In 1983, Beckes and Keyser (1983:355) stated that it should be a high priority to "develop and field test a predictive site distribution model . . . Development of such a system at Ashland would greatly facilitate the integration of cultural resource planning with other resource programs". The use of predictive models has, however, met with mixed success and a great deal of criticism (Berry 1984; Tainter 1984). This study will evaluate the potential for the use of predictive models on the Ashland District.

All sites recorded on the District prior to the fall of 1988 (a total of 466 sites with 488 components) will be used to develop the model.

The model will be tested using the data obtained by a survey which has been conducted recently on the Ashland District. In July of 1988, a forest fire (the Schiller Fire) burned 16,000 acres on the Ashland District; 12,000 acres of which were on federal land (Wettstaed 1988; in press). A total of 6,065 acres of this area was intensively surveyed for emergency salvage timber sales and 121 prehistoric sites were recorded (Wettstaed 1990).

An important part of developing a predictive model is testing that model. The model to be developed by this study will be tested utilizing the results of the Schiller Fire surveys. For this reason, the sites located by these surveys will not be utilized in the first part of the study. Once the predictive model has been tested, the sites used to test the model will be added to those utilized in the first part of the study. A final model of land use patterns on the Ashland Ranger District will then be presented.

CHAPTER 2

ENVIRONMENT

The Ashland District of the Custer National Forest is located in southeastern Montana (Figure 1), a part of the Northwestern Plains Region. As the Northwestern Plains are characterized by great diversity, often over short distances, it is not possible to describe the typical environment of the entire area. In general, the Northwestern Plains can be said to be a region of constant wind, cold winters, short summers, and rapidly changing, often violent weather. Even considering the great diversity of the region as a whole, the part of the Northwestern Plains located between the Bighorn Mountains (Wyoming) and the Black Hills (South Dakota and Wyoming) is quite different. This area is broken by mesas, buttes, and valleys, and supports an excellent growth of grass (Frison 1978:3-8). The Ashland District is located in this region, which has been referred to as the Pine Parklands.

The Pine Parklands forms an area of approximately 2,000 square miles of atypical Plains environment between the Bighorn Mountains and the Black Hills. Culturally, the Pine Parklands often appear as a dividing line between the northern and southern parts of the Northwestern Plains. Because of the difference in environment, the subsistence strategies employed in the Pine Parklands appear to be different from the neighboring Plains areas (Fredlund 1981:115-117; 1987:201-203). The region is drained by northward flowing rivers (the Bighorn, Tongue, Powder, and Little Missouri Rivers) and their tributaries, which empty into the Yellowstone River. Most of the smaller streams are seasonal in nature (Munson and Anderson 1982:15).

In general, the climate of the region can be described as being semi-arid and continental. Precipitation is low, with regional differences over the Ashland District itself because of variations in topography. The south-central part of the District averages 20 inches of precipitation, while the northern part averages 15 inches, and the southern, eastern, and western boundaries average 13 inches (Hansen and Hoffman 1988:3). Most precipitation falls as rain between April and September, with May and June being the wettest months. Storms are generally short, intense, and localized. Snowfall averages approximately 30 inches in the valleys, with somewhat more in the higher elevations (Beckes 1976:5). Periods of drought have, on the average, been recorded every 20 years, however, wet periods which offset the droughts tend to occur every 10 years (Waldman 1979). The area lies within the Alberta storm belt, resulting in a strong year round flow of air from the Mountains to the west. This strong flow of air often results in warm winds known as chinooks. In the winter, these chinooks quickly raise the temperature and melt the snow, while in the summer they rapidly evaporate surface water and dry the vegetation. Temperatures in the summer reach a high of 95 to 105 degrees F, while winter lows commonly drop below 0 degrees F (Beckes 1976:5; Beckes and Keyser 1983:266; Munson and Anderson 1982:17-18).

The Ashland District is situated on the Paleocene Age Fort Union formation, in particular, the Tongue River member. This formation consists of multiple beds of sandstone, sandy shale, shale, and coal. Sandstone is often found in beds up to 100 feet thick and commonly erodes into isolated buttes, cliffs, and knobs (Warren 1959:564-565). Lignite coal beds are found throughout the formation and at some point in the past some of these coal beds caught fire. The heat from these fires metamorphosed the surrounding shales into scoria, or clinker. These scoria beds are resistant to erosion and form the caprock for many of the prominent buttes, mesas, and ridges in the region (McConnell 1971:2; Munson and Munson 1980:19; Warren 1959:565).

Another result of the metamorphosing of the shale was the creation of porcellanite, which is the primary lithic raw material utilized by the prehistoric inhabitants of the region (D. Fredlund 1976). Outcrops of porcellanite can be found all across the Ashland District. Porcellanite most commonly is found in several shades of gray, with various reddish colors being the next most common. Less frequent colors include yellow, black, brown, and purple. The color and luster of the material appear to vary depending on the amount of heat it was exposed to and the rate of cooling. Both vitreous and non-vitreous examples occur. While porcellanite has good fracture characteristics, it is not as good as cryptocrystalline materials such as chert. Porcellanite is also a softer material and does not hold an edge as long as the cryptocrystalline materials (D. Fredlund 1976:208-209).

The strata of the Fort Union formation are nearly flat, with an average dip to the southwest of approximately 20 feet per mile. Alluvial deposits of Quaternary age can be found in the stream valleys, along with an occasional thin late Cenozoic age deposit in the larger valleys. These deposits generally consist of sand, silt, clay, and gravel of clinker and sandstone (Warren 1959).

The distinctive topography of the region has resulted from the down-cutting of the major rivers and their tributaries into the flat plateau of the Fort Union formation. Shale and sandstone were eroded while the clinker beds were not. As a result, the overall topography is that of a plateau which has been steeply downcut in many places, with the common landforms consisting of sandstone and shale escarpments, scoria and sandstone buttes, badlands, and steep stream valleys. Relief can be quite severe, varying in elevation from 2900 feet to 4400 feet above sea level, with a change of 500 feet in elevation within 1/4 mile being common. Shale and sandstone outcrop more frequently on southfacing slopes, with small side drainages also found on these same southern slopes (Beckes 1976:2-4; Warren 1959:563-564).

The Ashland District is bordered on the west by the Tongue River and on the southeast by the Powder River. These rivers form the primary drainage system for the region. On the District itself (Fig. 2), the main drainage is Otter Creek, which flows north through the center of the District to join the Tongue River at the town of Ashland. Otter Creek is fed by many small creeks, primarily seasonal in nature, which are generally oriented in an east-west direction. These drainages form natural travel routes to access all parts of the District. The larger tributary creeks have wide floodplains, and distinct terraces can be found in many drainages (Beckes 1976:3-4).

As the name Pine Parklands implies, the region contains large areas of both forest and grassland. The Ashland District is more heavily wooded than most parts of the Pine Parklands. Approximately 50% of the District is forested. Ponderosa pine is by far the dominant

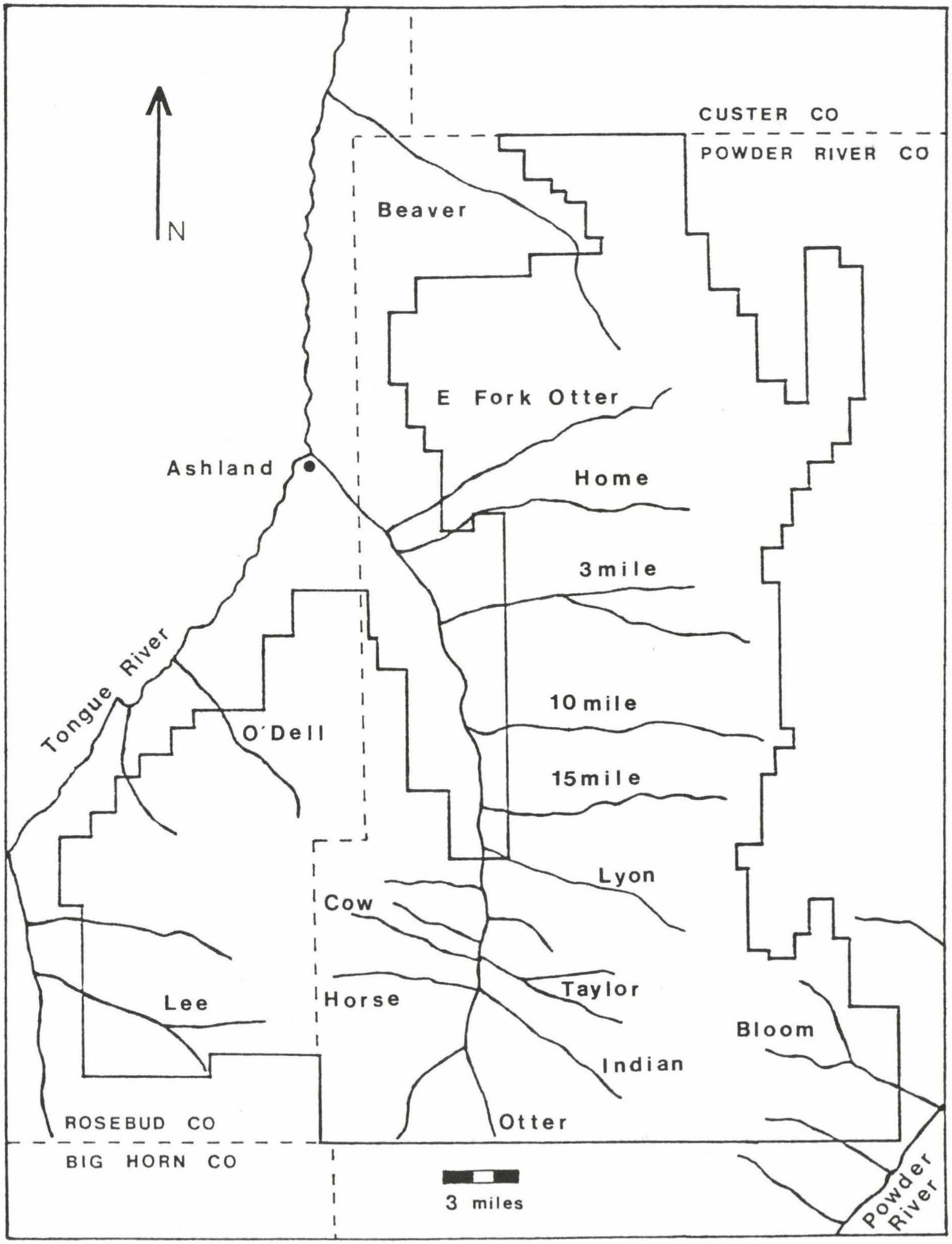

N
CUSTER CO
POWDER RIVER CO
Beaver
E Fork Otter
Ashland
Home
3mile
Tongue River
10mile
O'Dell
15mile
Lyon
Cow
Taylor
Lee
Horse
Bloom
Indian
Otter
ROSEBUD CO
BIG HORN CO
3 miles
Powder River

FIGURE 2
Ashland Ranger District - location of major creeks.

species, occurring in both small scattered patches and in thick stands with large volumes of timber. Green ash and cottonwood can be found along the drainages. Scattered stands of aspen occur in the higher elevations and Rocky Mountain juniper commonly occurs on the xeric slopes (Komberec personal communication 1989; McConnell 1971:45).

The other distinct vegetative community found on the District is open grasslands, which are more of a mixed grass prairie, rather than the shortgrass prairie of the surrounding regions. Typical climax species include green needlegrass, needle-and-thread, and western wheatgrass, with subordinate species being native bluegrass, prairie junegrass, and blue gramma. Several different forbs and shrubs, such as threadleaf sage, can be found with the grasses (McConnell 1971:58-59).

Two distinct areas exist on the Ashland District. The northern part of the District, north of Home Creek (Fig. 2), is characterized by steep forested ridges. Sandstone outcrops are much less common than in the south and many of the good quality porcellanite outcrops on the District are located in the northern part. There are no upland prairies in the north. In contrast, the southern half of the District is dominated by broad upland grasslands. This upland is broken by a few steep stream valleys with wooded hillsides. Sandstone outcrops are more common in the south, and there are not as many thick stands of ponderosa pine (Beckes and Keyser 1983:265-266).

A total of ten distinct ecozones have been defined and mapped on the Ashland District. As these ecozones are one of the variables to be included in the site location study, they will be more fully discussed in the methods section.

CHAPTER 3

CULTURE HISTORY

Human habitation in the Ashland area goes back at least 10,500 years. While there have been a number of chronological outlines proposed for the Northwestern Plains, Frison's (1978) was developed specifically for Wyoming and surrounding areas, including the Pine Parklands region. For this reason, the chronological outline followed here will be that of Frison (1978). There are five periods in this chronology: the Paleoindian Period (11,500 to 7,500 B.P.), the Early Archaic Period (7,500 to 4,500 B.P.), the Middle Archaic Period (4,500 to 3,000 B.P.), the Late Archaic Period (3,000 to 1,800/1,200 B.P.), and the Late Prehistoric Period (1,800/1,200 to 250 B.P.). Almost all of the cultural complexes discussed in this chapter are named after a characteristic projectile point style. The following discussion will review the Northwestern Plains in general and will focus on the particular complexes found in the Ashland area (Figure 3).

PALEOINDIAN PERIOD - 11,500 to 7,500 B.P.

The earliest accepted evidence for the presence of humans in the New World is the Clovis Complex, dating to approximately 11,500 years before present (B.P.). There have been a number of sites claimed to represent the presence of humans in the New World prior to Clovis, however, there are problems with all of these proposed sites (Stanford 1983). Sites such as Meadowcroft Rockshelter (Adovasio et al. 1983;

Figure 3
NORTHWESTERN PLAINS CHRONOLOGY

TIME (B.P.)	CULTURAL COMPLEX		PERIOD
11,500			
	Clovis		
11,000			
	Folsom		PALEOINDIAN
10,500			
	Plano Tradition		
10,000	Agate Basin		
	Hell Gap		PERIOD
9,500			
	Alberta		
9,000			
	Cody		
8,500			
	Terminal Paleoindian		
8,000	Complexes		
7,500			
7,000			
6,500	(Altithermal		
			EARLY
6,000	Climatic		
			ARCHAIC
5,500	Episode)		
			PERIOD
5,000	Oxbow		
4,500			MIDDLE
	McKean		
4,000			ARCHAIC
3,500			PERIOD
3,000	Pelican Lake		
	Yonkee		LATE
2,500			
	Besant		ARCHAIC
2,000	Unnamed Pine Parklands		
	Archaic		PERIOD
1,500			
	Avonlea	(Bow &	LATE
1,000	Powder River Ceramic Tradition	Arrow)	
	Small Side-notched Points		PREHISTORIC
500			
		(Horse)	PERIOD

(adapted from Frison 1978:Figure 2.26)

Haynes 1980) and Old Crow Flats (Irving and Harington 1973; Guthrie 1984), while offering tantalizing possibilities, have been rejected as pre-Clovis sites by most researchers, although Meadowcroft may yet be accepted (Adovasio et al. 1990). A possible mammoth kill in the Central Plains dating to 17,000 B.P. has recently been discovered (Holen et al. 1990), but a great deal of work remains to be done on this site. Until unassailable proof of a pre-Clovis site is found, the Clovis Complex and a date of 11,500 B.P. will remain the accepted date for the entry of humans into the New World.

The Paleoindian Period begins with the appearance of the Clovis Complex all across North America. In the Northwestern Plains, the chronology for this period is fairly well defined and it is in this area that many "classic" Paleoindian sites are located. A series of multi-component sites, such as Hell Gap (Irwin-Williams et al. 1973) and Agate Basin (Frison and Stanford 1982) have provided the basis for this chronology. The diagnostic artifact of the Paleoindian Period is the long lanceolate shaped spear point. Unique among the first Paleoindian complexes are the first two, Clovis (11,500 - 11,000 B.P.), and Folsom (10,800 -10,500 B.P.), which are characterized by the removal of flutes (long, wide flakes running up the point from the base) on both faces of the point. Clovis is best known for mammoth kill sites. Following the extinction of the mammoth and other Pleistocene fauna after 11,000 B.P., bison hunting became the primary means of subsistence on the Northwestern Plains (Frison 1978:27-31). The Goshen Complex is a lithic technology which appears to be related to both Clovis and Folsom. Radiocarbon dates associated with Goshen have been obtained which are contemporaneous with both complexes, although at Hell Gap Goshen was found stratigraphically below Folsom (Frison 1990; Irwin-Williams et al. 1973).

After the end of the Folsom Complex around 10,500 B.P., there followed a series of complexes defined by differences in the appearance of unfluted lanceolate shaped points. These complexes have been labeled the Plano Tradition, which lasts from 10,500 to 7,500 B.P. The first of the Plano Tradition complexes is the Agate Basin Complex, and this represents the first evidence for the presence of humans in the Ashland area. Agate Basin points are long and parallel-sided with a lenticular cross-section and exceptional workmanship. Grinding was done on the base and up the sides to approximately the widest part of the point (Frison 1983:114; Irwin-Williams et al. 1973:47).

The Hell Gap Complex (10,000 - 9,500) and the Cody Complex (8,800 - 8,400 B.P.) follow the Agate Basin Complex. Hell Gap points have tapered stems and pronounced shoulders, with convex to rounded bases and some edge grinding (Irwin-Williams et al. 1973:48). Three different point styles are associated with the Cody Complex, two of which (Cody Knives and Scottsbluff points) have been found on the District. Cody Knives are asymmetrical in shape and have a transverse blade with a stem that has a single, distinct shoulder. Scottsbluff points are wide points with thin shoulders, broad stems, and transverse parallel flaking (Bradley and Frison 1987; Frison 1987a; 1987b). An atypical (very small in size) Scottsbluff point was found in one of the lower strata of Horseshoe Cave (24RB1073) on the Ashland District in 1975 (Bonnichson and Keyser 1982). One heavily reworked Alberta point (10,000? - 9,000 B.P.) has been found on the District (Beckes and Keyser 1983:270-272). Alberta appears to be very closely related to

Cody (Bradley and Frison 1987). Sites dating to the period from 10,500 to 8,500 B.P. are more common than Clovis, Goshen, or Folsom Complex sites (Deaver and Deaver 1988:80).

Three additional Paleoindian projectile point styles have been found on the District. These are Angostura, Jimmy Allen, and Browns Valley. All three styles date to the end of the Paleoindian Period, and their relation to the other styles is not clear. These point styles are considered to be terminal Paleoindian and there are a wide variety of what appear to be localized manifestations. By this time two separate economic orientations had appeared on the Plains - a broad spectrum hunting and gathering pattern in the mountains and a communal bison hunting pattern on the open Plains. The terminal Paleoindian complexes were the bison-oriented groups (Frison 1978:34-40; Sundstrom 1989:38-40).

EARLY ARCHAIC PERIOD - 7,500 to 4,500 B.P.

The Early Archaic Period has generally been considered to begin with the sudden appearance of side-notched points, which replaced the lanceolate shaped points of the Paleoindian Period. Very little is known about the Early Archaic in the Northwestern Plains. This was the time of the Altithermal Climatic episode, which was a period of increased temperatures and decreased precipitation for all of North America. As a result of this long-term drought, the climate of the Ashland region would have been much dryer and warmer than is typical today. Very few, if any, archaeological sites have been found on the open Plains. In the past, investigators believed the Plains were completely abandoned at this time. It is believed now, however, that people lived in the areas around the Plains in the mountain and foothill regions and may have used the open Plains to some extent (Frison 1978:41-46). One possible reason for a lack of sites dating to this time period on the Plains could be the differential preservation of sites. A great amount of erosion would have been associated with the Altithermal, and most of the sites may have been destroyed at that time (Frison 1978:41-46; Reeves 1973). The few sites located in the open plains are special activity sites, primarily kill sites. People most likely utilized the plains, but did not inhabit them year round (Greiser 1981:41).

In recent years, however, an alternative hypothesis has been proposed. Sundstrom (1989:46-47) has suggested that there may not actually be a distinct gap between the Paleoindian and Middle Archaic Periods. Several stratified sites have been excavated in the Black Hills with a sequence of Paleoindian, Middle Archaic, Late Archaic, and Late Prehistoric. Some of the terminal Paleoindian complexes (Jimmy Allen, Angostura) closely resemble the McKean lanceolate style projectile point. Sundstrom (1989:46) suggests that the very close resemblance between the terminal Paleoindian complexes and the McKean lanceolate style points is an actual stylistic relationship and that there is no temporal gap between these point styles. The terminal Paleoindian complexes developed into the McKean complex without an intermediate stage as has previously been proposed. She believes that the lack of projectile points assigned to the Early Archaic Period is actually the result of a misclassification of projectile point styles. A number of the sites which have been assigned Paleoindian or Middle

Archaic dates strictly on stylistic grounds may actually be Early Archaic in age.

Three sites on the Ashland District have been assigned to the Early Archaic Period. All of these points have been described as being Oxbow style points. Oxbow (5,500-4,600 B.P.) appears on the Northern Plains towards the end of the Early Archaic Period (Gregg 1985:105). The Pine Parklands are roughly the southern boundary of the region which contains Oxbow style points (Deaver and Deaver 1988:87). These points have shallow side-notches, are basally thinned, and often have an eared appearance. A few sites on the Plains contain both Oxbow and McKean style points and Oxbow appears to be partially contemporaneous with McKean (Beckes and Keyser 1983:97-98; Frison 1978:45-46). Sundstrom (1989:48-56) considers Oxbow to be Middle Archaic in age.

MIDDLE ARCHAIC PERIOD - 4,500 to 3,000 B.P.

The Middle Archaic Period is synonymous with the McKean Complex in the Northwestern Plains. McKean suddenly appears in the region and is found over a wide area. One of the major problems associated with the McKean Complex is that it consists of a wide variety of point styles. Some sites, such as single purpose kill sites, contain only one style of point, while others contain the entire range of styles. It has been suggested that these different styles could represent a series of different styles caused by change through time, or different cultural groups which practiced the same lifestyle. Those sites which contain many point styles could represent different bands joining together (Beckes and Keyser 1983:98-99; Frison 1978:49-50). The widespread distribution of McKean probably indicates a rather large population increase compared to that during the Early Archaic (Greiser 1981:41). This follows a return to more favorable climatic conditions with the end of the Altithermal.

Three primary point styles are assigned to the McKean complex - McKean lanceolate (lanceolate in shape with an indented base and convex blade edges which are slightly narrower at the base than they are in the middle), Duncan (a side-notched, stemmed point with sloping shoulders), and Hanna (a side notched, expanding stemmed point with distinct shoulders) (Frison 1978:46-56), although some researchers consider Duncan and Hanna to be culturally distinct from McKean. The Duncan and Hanna styles are somewhat later in time than the McKean and are geographically more evenly distributed (Deaver and Deaver 1988:90-91). Grinding slabs and manos are common in many McKean sites in southern Montana and Wyoming and have been taken as evidence for a heavy use of plant foods. Actual floral remains, however, are rare in McKean sites. This is the first appearance of true manos and metates in the region. Large numbers of roasting pits, some quite large, have also been found in McKean sites (both lined with rock and unlined). McKean subsistence probably consisted of diversified hunting and gathering with the type of food being exploited depending on seasonal availability (Frison 1978:47-49; Keyser 1986). While the McKean Complex is geographically widespread, it consisted of many small, local populations utilizing the same general cultural tradition Keyser 1985).

It is during the Middle Archaic Period that stone circle sites first appear. These are believed to represent the remains of tipi rings, with the stones having been placed around the edges of the tipis in order to help hold them down against the wind (Frison 1978:51-53). Tipi ring sites are rare in the area around Ashland.

LATE ARCHAIC PERIOD - 3,000 to 1,800/1,200 B.P.

The Late Archaic was the time of the heaviest occupation of the Pine Parklands region. According to Fredlund (1987:201), Late Archaic sites account for 42% of all of the sites in the region which can be assigned to a cultural affiliation. On the Ashland District, 38% of the dateable sites are Late Archaic in age. The McKean Complex is replaced by several different point styles throughout the Northwestern Plains, including Yonkee, Pelican Lake, Besant, and an unnamed complex found throughout the Pine Parklands. All four of these complexes are represented in the Ashland area (Beckes and Keyser 1983:101-104, 280-281).

Until recently, Yonkee points were considered to be a part of the McKean Complex. Yonkee has been redated recently and placed in the Late Archaic (Bump 1987). Yonkee is quite well represented in the area around the Ashland District, but is not very common on the District itself. Almost all sites are bison kill sites, and few campsites are known. No campsites have been excavated (Deaver and Deaver 1988:93). All Yonkee kill sites show the same type of butchering process, and all were arroyo traps except for Kobold (Frison 1970), which is a jump. At these sites the projectile points were found mainly in the rib cages of the bison, and large parts of the body were left intact. Rib cages and long bones were not removed. It appears that the hunters were simply stripping the meat from the body and ignoring the marrow in the long bones. At site 48SH311 entire carcasses were stripped of meat and then thrown together in a pile. Most of these kills were in the late fall and the meat was probably being stored for the winter (Frison 1978:203-210). These kills were cooperative, but the processing and distribution of the meat took place at the level of the family (Frison 1971:86-87).

The Pelican Lake Complex (3,000-1,700 B.P.) is found throughout the region and is characterized by corner-notched points with straight to slightly concave bases and blade edges. Notches are wide and open and form sharp points at the spot where the blade edges meet the base. Only a few Pelican Lake points have been reported from the Ashland area and most are surface finds. An exception to this is the lower component at Coyote House (24PR601), which contained several Pelican Lake points in addition to bifacial blades, scrapers, and a large amount of chipping debris (Beckes and Keyser 1983:287-288). This complex is loosely defined and poorly understood. Bison hunting was probably the main means of subsistence, much more so than for McKean (Keyser and Davis 1984:50-57).

The Besant Complex (2,000-1,350 B.P.) is found throughout the Northwestern and Northeastern Plains. Besant represents what is probably the most sophisticated bison hunting system ever developed. Appearing first in the Northeastern Plains and spreading west, Besant is believed to have had some connection with the Plains Woodland complexes to the east. In the eastern part of the Plains, Besant sites contain burial mounds (this manifestation is often referred to as Sonota), and many Besant sites contain Woodland pottery (Gregg 1985:118-124). The Ruby site in Wyoming (Frison 1971) contained the remains of what was interpreted to be a ceremonial structure, and it has been suggested that there was an elaborate ceremonial system involved in bison hunting. Bison were killed with the use of pounds. Besant points vary in form, but in general are large side-notched points which rapidly expand from the tip and have a thick, lenticular cross-section. Bases are thinned and the base and notches are ground (Beckes and Keyser 1983:103-104; 281-282; Frison 1978:56-62, 213-223; Johnson 1970b; 1977).

L. Fredlund (1987:224) has suggested that Besant is rare in the Pine Parklands region because the indigenous population was hostile to outsiders such as the Besant people. However, it is possible that the local topography may be equally responsible for the lack of Besant in the Pine Parklands (Beckes and Keyser 1983:282). Besant subsistence is traditionally believed to have focused exclusively on hunting bison, and the Pine Parklands are not a good area for hunting large herds of bison. There are few places on the Ashland District which can be considered to be good kill locations. Fraley (1988) concurs that the likely reason for a lack of Besant (and also the partly contemporaneous Avonlea complex) in the northern Powder River Basin (which includes the Ashland District) is due to environmental/topographical differences compared to the regions to the north. Sundstrom (1989:60), however, reports that in the southern part of the Black Hills Besant subsistence patterns are much more diversified. In addition, Hughes (1989) suggests that communal bison hunting may have been only one aspect of Besant subsistence practices. Pottery commonly occurs in Besant sites to the east, and there is debate as to whether Besant should more properly be classified as Late Archaic or Plains Woodland (Johnson 1977; Sundstrom 1989:61-63).

Most of the sites dating to the Late Archaic Period in the Pine Parklands do not belong to a defined complex. There are a variety of unnamed corner and side-notched projectile points. These are generally short, wide, and thick triangular dart points which come in a variety of styles. Similar points have a wide distribution along the Montana-Wyoming border, and many examples have been recovered from cave sites around the Big Horn Basin. Sites are generally small camp sites located near reliable water sources or in rockshelters. Rockshelter sites may represent winter occupations. The artifact assemblages recovered from these sites are smaller and less diverse than those found in sites of earlier or later periods (Beckes and Keyser 1983:280-284). Only one kill site in the area - Kobold Level III (Frison 1970) - has been associated with this unnamed complex.

One site dating to the Late Archaic Period has been excavated on the Ashland District, the One Bear site, 24PR402 (Keyser and Davis 1981). This was a small, short-term camp site which was probably occupied in the spring or early summer. A single hearth and three activity areas were located at the site. Based on the presence of only one hearth, the One Bear site was most likely occupied by a family-sized group of about 25 people or less. Only medium and small sized game were represented in the faunal materials recovered from the site. One C-14 date was obtained from the One Bear site, 1240±65 B.P. or A.D. 710±65 (Tx-3690) (Keyser and Davis 1981:138-164).

Keyser and Davis (1981:138-168) proposed a model for the Late Archaic habitation of the Pine Parklands based on the results of their work on the One Bear site. They hypothesized that this area was inhabited by small family sized bands who existed on a diversified seasonal foraging economy. During most of the year, these small groups of about 25 people would periodically move through the region to take advantage of the different resources offered by the various ecosystems found in the area. These groups would then seasonally aggregate into larger groups for special events, such as communal bison kills like that represented by the Kobold site. The inhabitants of the Pine Parklands were probably a conservative group. This can be inferred from the heavy reliance on local raw materials and the continued use of dart points. Dart-using Late Archaic populations existed in this area as late as A.D. 750, while the bow and arrow was introduced onto the Northwestern Plains at approximately A.D. 200 (Keyser and Davis 1981:165-166).

LATE PREHISTORIC PERIOD - 1,800/1,200 to 250 B.P.

The Late Prehistoric Period is marked by the appearance of the bow and arrow on the Northwestern Plains. This event occurred at different times throughout the Northwestern Plains. With the advent of the bow and arrow, projectile points became smaller and were primarily side-notched, though some corner-notching continued. The Avonlea Complex represents the first appearance of bow and arrow using people on the Plains. This complex originated in the Northern Plains of Alberta and Saskatchewan and moved south over time. Avonlea points are small, thin side-notched points of excellent workmanship. Notches are low on the blade and usually V- or U-shaped. The base is concave to straight and the stem corners are rounded to form ears (Beckes and Keyser 1983:106-107, 109; Frison 1978:62-64; Johnson 1970a). While Avonlea points are rare in the Pine Parklands, they do occur. Several classic Avonlea style points have been found on the Ashland District. Kehoe (1966) has suggested that Avonlea may represent the initial appearance of Athapascan speakers on the Plains. This movement eventually resulted in the appearance of the Apache and Navajo in the Southwest.

Frison (1978) did not define any complexes for the Late Prehistoric Period. He did, however, indicate that there might be a regionally distinct complex found in the Pine Parklands. The unnamed complex "is characterized by small, thin, delicately made projectile points with a wide range of notching styles" (Frison 1978:71). Some Avonlea and 'Avonlea-like' points are found in sites associated with this complex. Camp sites tend to be located on butte tops and along the rims of canyons. Large amounts of faunal material are found in sites associated with this complex (much more so than in Late Archaic sites). This complex appears to be related to Avonlea, but the exact relationship is not known (Frison 1978:71; 1988). Fredlund (1981; 1987; 1988) has called this complex the Benson's Butte - Beehive Complex (Beehive from here on following the suggestion of Greiser 1988). Her definition is based on work at the Benson's Butte site (24BH1726) (L. Fredlund 1979). This complex is said to represent a variant of the Avonlea complex in the Pine Parklands. It is also considered to equal the "little known cultural manifestation" described by Frison (1978:71). A total of eight sites associated with the complex are reported for the Pine Parklands, and L. Fredlund (1987:214) reports that this complex can be found from southern Montana to northwestern Colorado. The main justification for inclusion in this complex is the presence of Avonlea style points, or the presence of sites on butte tops or canyon rims. Tools commonly found in Beehive complex sites are basically the same as those found in other sites at the same time, but there tend to be more tools in Beehive sites. In addition to Avonlea and 'Avonlea-like' points, many other styles of small side-notched points occur in Beehive sites (Fredlund 1988).

Reeves (1988), however, has questioned L. Fredlund's (1988) definition of the Beehive complex. He argues that her definition is so general as to be of little use. Reeves prefers instead to follow Frison's (1988) lead and call these sites Avonlea, but to note the differences which exist. Greiser (1988), in contrast, agrees with Fredlund's (1988) definition of the Beehive Complex, and recognizes real differences between Avonlea and the Beehive Complex. No Beehive Complex sites are found on the Ashland District; all Avonlea style points found on the district are classic Avonlea. Beckes (personal communication 1989) suggests that the Beehive Complex is present on the Ashland District, but that it has not been recognized. This may change as the complex is better defined.

The other Late Prehistoric Period complex defined by L. Fredlund (1987:218-220) is the Big Sky Complex. This includes all sites which do not contain Avonlea or Besant (which she includes in the Late Prehistoric) style points. Sites are short term camps, usually along drainages, but also along sandstone ridges. The assemblage consists of a variety of projectile point styles, primarily Plains or Prairie side-notched style points. L. Fredlund (1987:219-220) includes the Sam Lei bison kill site (24PR1032), which is located on the Ashland District, in this complex. A date of A.D. 310±110 is attributed to this site by Fredlund (1987:219). This date is incorrect, the actual date being 310±110 years B.P., or A.D. 1640±110 (McLean 1976:37), and Sam Lei can not belong to this proposed complex. The characteristics used to define the Big Sky Complex are so generalized as to be almost useless. For example "the primary characteristic of this classification of sites is the lack of consistent form to the points" (L. Fredlund 1987:219). These projectile point styles are found all across the western U.S. at this time and can not be used to define a particular complex (Beckes and Keyser 1983:113). Similar points can be found in the Beehive Complex, with the only real difference between it and Big Sky being the location of sites and the presence or absence of Avonlea points.

In general, the Late Prehistoric Period is represented by a wide variety of side and corner-notched projectile point styles. Some researchers refer to the various point styles of this period as the Old Woman's Phase (Deaver and Deaver 1988:104). Others try to define different point styles, each with a distinct temporal placement (Kehoe 1966).

It was during the Late Prehistoric that bison hunting reached its peak. Large cooperative kills generally occurred in the fall or early winter. These involved several bands joining to make a kill, and all aspects of the kill, including butchering, were cooperative. This is in contrast to the Archaic, during which butchering appears to have been carried out by individual family groups (Reher 1977; Reher and Frison 1980). There are several small bison kill sites in the area around the Ashland District, though only one, Sam Lei (24PR1032), is located on the District itself.

One distinct complex does exist during the Late Prehistoric Period in the Pine Parklands. This complex is characterized by the presence of ceramics. While ceramics are not very common on the Northwestern Plains, they do occur and several different ceramic complexes have been defined (Frison 1978:64-69). Several sites which contain pottery have been found in and around the Powder River Basin. These sites were originally believed to represent the arrival of the Crow Indians in the area (Frison 1976; 1979). All of the sites reported by Frison are dated after A.D. 1400, and Crow tradition places them in the region by A.D. 1600 (Frison 1976:44).

Excavation of the Highwalker site (24PR627) on the Ashland District has resulted in a somewhat different interpretation of these ceramic sites (Davis and Keyser 1982; Keyser and Davis 1981; 1982). Ceramics at the Highwalker site are dated to A.D. 1050, much earlier than the purported time of the Crow-Hidatsa split. The ceramics resemble those of the Riggs and Fort Yates phases of the Extended and Terminal Variants of the Middle Missouri Tradition. Keyser and Davis (1981; 1982) labeled the ceramic manifestation in the region the Powder River Ceramic Tradition. They hypothesize that the inhabitants of the region in some way established and maintained contact with the farmers of the Middle Missouri region and in this way acquired Middle Missouri style ceramics. After about A.D. 1400 the Crow began to move from the Middle Missouri region in small groups and to live with the inhabitants of the Pine Parklands. The Crow eventually became the dominant inhabitants of the region. This hypothesis agrees with the pattern for Crow migration proposed by Wood and Downer (1977).

Towards the end of the Late Prehistoric Period the Northwestern Plains experienced a series of tribal migrations. Except for the Crow, every tribe found in Montana east of the Rocky Mountains moved into the area after A.D. 1600, most after A.D. 1800 (Hewes 1948; Malouf 1967). Besides the Crow, three other groups are known to have inhabited the Pine Parklands area. The Shoshone moved northeast from the Great Basin and at one point occupied a large part of the Northwestern Plains before being driven out by the Blackfeet. Characteristic of the Shoshone occupation is the presence of the petroglyph motif of a Shield Bearing Warrior with bear tracks. Examples of this motif have been found on the Ashland District (Beckes and Keyser 1983:297; Keyser 1975).

The other tribes known to have been in the area are the Cheyenne and the Teton Dakota (Sioux). The Cheyenne were in the area of the Black Hills in the late 18th century and were forced west into the Powder River Basin by the Teton. By A.D. 1780 the Teton were definitely in the area and there was constant conflict between the Teton and the Crow in the area between the Black Hills and the Yellowstone River. The Northern Cheyenne, who split from the Southern Cheyenne around A.D. 1830, remained in the northern Powder River Basin with the Teton. It was only when they were defeated by the U.S. government that the Teton were forced out of the area. The Crow Reservation was established in 1869 and the Northern Cheyenne Reservation in 1884 (Malouf 1967; Reher and Frison 1980:33-34).

CHAPTER 4

SETTLEMENT PATTERN STUDIES IN THE ASHLAND AREA

Since 1970 there has been a large number of survey projects conducted in the area around the Ashland District. Most of the surveys were associated with coal development projects. These coal related surveys have centered around the towns of Decker and Colstrip (Figure 4). The other area where there has been a large amount of activity is the Ashland District of the Custer National Forest, which is located roughly equidistant between Decker and Colstrip.

The quality of these surveys has been quite varied and it is not always possible to make accurate comparisons between the surveys, a problem which is found everywhere (Schiffer 1987:346-353). Many of these surveys (for example Munson and Anderson 1982; Munson and Munson 1980; Waldman 1979) have utilized the concept of Minimal Activity Loci (MALs), or "indistinct" sites when reporting the results of the surveys. Minimal Activity Loci are defined as "locations which have a small amount of cultural debris and have the potential to yield limited information in the interpretation of prehistoric or historic cultural activity" (Munson and Anderson 1982:68). These are treated as something different than actual sites, but somewhat more significant than isolated finds. In most cases, MALs are not considered to the same extent as sites in the reports when discussing site distribution and are reported separately from sites. Settlement pattern discussions in these reports frequently only consider sites, with only a brief

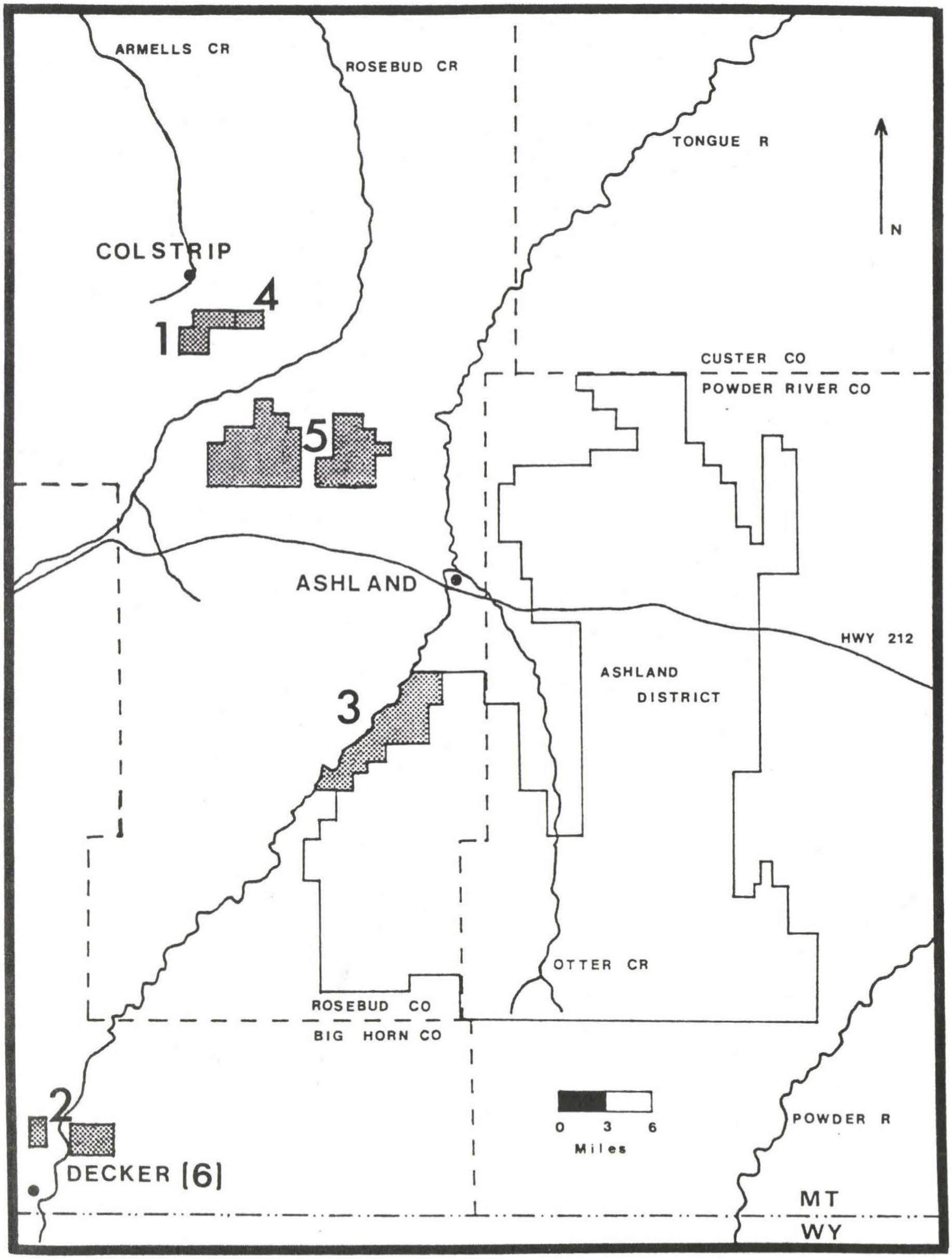

ARMELLS CR
ROSEBUD CR
TONGUE R
N
COLSTRIP
1
4
CUSTER CO
POWDER RIVER CO
5
ASHLAND
HWY 212
ASHLAND
DISTRICT
3
OTTER CR
ROSEBUD CO
BIG HORN CO
2
POWDER R
0
3
6
Miles
DECKER (6)
MT
WY

FIGURE 4
Location of previous surveys in the Ashland area.
(Key is on the next page.)

Key to Figure 4,

Previous Studies in the Ashland Area

1. D. Fredlund 1973
2. L. Fredlund 1977
3. Waldman 1979
4. Munson & Munson 1980
5. Munson & Anderson 1982
6. Greiser 1981

   (Survey area not shown on map,
   located near Decker)

mention of MALs, which are by far the most common type of site found by surveys in the region. Some survey reports (Beckes 1976; Greiser 1981; McLean 1975), however, have utilized a standard site definition.

Site definition can be a problem for any research project (see Plog et al. 1978:385-389) and some researchers (for example, Dunnell and Dancey 1983; Thomas 1975) have suggested that the concept of "site" should no longer be used. A primary problem with the use of MALs is that they result in a skewed picture of the distribution of human activities over the landscape. Thomas (1973) is cited to show that MALs can provide useful archaeological data (Munson and Anderson 1982:343), however, the use of MALs by these studies is inappropriate. The whole point of the argument presented by Thomas (1973; 1975; see also Dunnell and Dancey 1983) is that it is not the distribution of sites which must be examined, but rather the distribution of individual artifacts. A site is nothing but a cluster of such artifacts. "Using site to structure recovery limits data collection to a small fraction of the total area occupied by any past cultural system and systematically excludes nearly all direct evidence of the actual articulation between people and their environment" (Dunnell and Dancey 1983:271-272, emphasis in original). This type of approach has been called a siteless survey. By defining an additional category of site (MALs), which is not given equal consideration with other types of sites, researchers such as Munson and Anderson (1982) only make the situation more confusing.

The use of MALs defeats the purpose of siteless survey and also results in a skewed analysis of the distribution of sites. If the distribution of sites is going to be considered, then all sites must be utilized in such a study, not just prominent sites. A majority of the sites in the region can be defined as MALs. For example, Munson and Munson (1980:102) report that 19 prominent and 67 indistinct sites were located during one particular survey (see also L. Fredlund 1987: Table 10.2). An accurate subsistence-settlement system can only be defined through the use of all records of human presence in an area, not just by focusing on prominent sites. Such small sites can provide useful information on past human activities (Tainter 1979) and must be considered when examining site distributions. The use of MALs can be a problem when comparing the results of surveys which use MALs with those which do not classify sites in this manner.

Another problem with comparing the results of the different surveys is that different ecozones have been defined and utilized by the various researchers. At least three different sets of terms have been employed. In some cases the ecozones have been explicitly defined by the researcher, while in other instances there is no clear definition. D. Fredlund (1973) defined two ecosystems, L. Fredlund (1977) utilized three resource zones, Greiser (1981) four general ecozones, and Beckes (1976) and McLean (1975) employed nine separate ecozones. This variety in ecozone definitions at times makes it quite difficult to accurately compare the studies.

The first systematic survey in the region was that of D. Fredlund (1973) which was conducted in 1971 near Colstrip (Figure 4). Fredlund hypothesized that the past inhabitants of the Pine Parklands region would have lived and hunted like the other predators in the area. Most predators live in the higher and more protected parts of the region (such as buttes, rockshelters, small secluded basins and draws) and hunt animals living in the open grassy areas and wide valleys. Hunters would have hidden from their game and descended to the open areas only to make a kill, causing as little disturbance as possible. Fredlund (1973:72-74) felt that the bison was an unimportant resource before the Late Prehistoric Period, but that the acquisition of the horse caused a radical change in the way people lived. With the horse, bison became the primary food source and people moved out into the open areas for the first time. A seasonal transhumance pattern was also proposed by Fredlund (1973:72). This pattern was for the Pine Parklands to be inhabited in the winter and spring, the Bighorn Mountains in the summer, and the open plains in the fall. Fredlund's (1973) theory has largely been discounted as it simply does not agree with the archaeological record. For example, large Archaic Period bison kills such as Kobold (Frison 1970) and Powers-Yonkee (Bentzen 1962; Bump 1987) show extensive use of bison early in the cultural sequence. The picture of hunters cowering in the hidden and protected areas and rarely using the open spaces is also not supported.

The next extensive survey of the area, carried out on what is now the Ashland District of the Custer National Forest (Figure 4), was conducted by Beckes (1976) in 1973. Many of the sites reported by Beckes (1976) were located through interviews with local landowners. A majority of these sites were situated in the scoria/sandstone ecozone and near the major tributaries to Otter Creek. Beckes (1976; 1978) suggested that this ecozone was most frequently chosen for habitation sites because it provided the best access to the greatest diversity of resources. Late Prehistoric sites tended to be located at lower elevations, in more open areas, and closer to good water sources.

Archaic sites did not appear to cluster near water. All ecozones were utilized and Beckes (1978) argued that there was no support for D. Fredlund's (1973) predator/prey model. The settlement model proposed by Beckes (1976; 1978) was for a seasonal transhumance within the Pine Parklands region, with the different ecozones in the area being utilized at different times of the year. Late Prehistoric sites were probably located at lower elevations and in more open areas as a result of the greater reliance on bison which followed the introduction of the bow and arrow.

McLean (1975) conducted a follow-up survey to that of Beckes in 1975 on the Ashland District. McLean found that sites tended to cluster around good water sources and in the scoria/sandstone and lower slope fan/terrace ecozones. He suggested that these ecozones were heavily utilized because of the resource diversity and water availability associated with these zones. Both ecozones were equally utilized, thus contradicting Beckes' (1976; 1978) findings that the scoria/sandstone ecozone was the most heavily utilized. McLean did suggest that this difference may have been the result of local differences in topography, as his survey was conducted in the northern part of the District while Beckes' was focused primarily on the southern part. There are quite distinct differences between the two areas. He also found (1975; 1983) that contrary to Beckes (1976). Late Prehistoric Period sites were most frequently located in the higher elevations. McLean (1975) disagreed with the seasonal transhumance model proposed by Beckes (1976; 1978), suggesting instead that the whole area was only occupied seasonally. He later suggested (1983), however, that the area was inhabited year round, although he believed that little movement occurred.

The next survey in the area was L. Fredlund's (1977) near Decker (Figure 4), which located only 21 sites, most of which were located in the higher elevations and 100 to 400 meters from the nearest water source. Sites found by this survey also tended to be located on south facing slopes. Fredlund (1977:147-149) hypothesized that sites were not located near water sources for two reasons. One possible reason was that this would disturb the prey animals utilizing the water sources, while the other was that such locations had low topographical relief and were not good observation sites. This reasoning follows D. Fredlund's (1973) predator/prey model which can be rejected based on the results of the work by Beckes (1976; 1978) and McLean (1975). It also ignores the use of lookout sites for observation. Fredlund (1977:147, and Table 38) reports finding such sites on her survey and lookout sites are quite common in the area.

A survey conducted for the proposed Montco Mine (Waldman 1979) just west of the Ashland District (Figure 4) located 43 prominent sites, 236 indistinct sites, and 116 isolated finds. Prominent and indistinct sites were reported by Waldman (1979) to have roughly the same distribution among the various ecozones. There appeared to be a heavy use of the ridges and the sandstone ecozone. Large campsites, however, were most commonly located on upland grassland benches. Sites were most commonly located on ridges, with slopes and terraces the next most common locations for sites. Waldman (1979) argued that there was little evidence for the use of plant foods and that bison was the primary resource. He did not believe that there was a seasonal movement to the Bighorn Mountains.

The survey of the Big Sky Mine Area A near Colstrip (Munson and Munson 1980) (Figure 4) obtained somewhat different results from that of Waldman (1979). Indistinct sites were found to occur in much greater frequency in the open grasslands than did prominent sites. Large campsites were quite rare in the grasslands. Munson and Munson (1980) did find that the sandstone ecozone was heavily utilized.

An additional coal related survey conducted near Colstrip (Munson and Anderson 1982) (Figure 4) found further differences in site locations. A majority of sites were located near water and there did not appear to be any preferences for south facing slopes. There did appear to be a difference in the pattern of utilization between Late Archaic and Late Prehistoric sites. Late Archaic sites were located in the higher elevations, while Late Prehistoric sites were found in lower areas. Munson and Anderson (1982) attempted to determine if sites clustered in the area, hypothesizing that such clusters would represent a catchment area. Two patterns for site clustering were proposed. One such cluster consisted of a nuclear site (base camp) surrounded by several MALs, while the other type of cluster was a group of MALs. The way in which this hypothesis was tested was to have a computer generate randomly plotted sites. This distribution was then visibly examined to see if there were any clusters which resembled the proposed site clusters located by the survey. Munson and Anderson (1982:344-345) reported that there did indeed appear to be clusters among the randomly generated site locations, and that the observed site distributions could be the result of random placement. They then suggested that site clusters could be defined only if the researcher could provide definite justification for defining such clusters. If it appears that several sites are associated for a particular reason then a cluster can be defined. It was proposed by Munson and Anderson (1982:343-345) that these clusters represented catchments or the maximum extent of resource utilization for a particular group of people.

Their discussion of site clusters is rather disjointed and is not at all clear. Munson and Anderson's (1982:344) method for testing if site distributions were random is largely useless. Hodder and Orton (1976:30-97) provide an in depth discussion of a number of quite accurate methods to determine whether or not a distribution is random. A pattern which appears to be random may not turn out to be random if chronology or site type is taken into consideration (Hodder and Orton 1976:45, 53-55). Many variables affect site location, and horizontal and vertical relationships are also important. The biggest problem with Munson and Anderson's discussion is that they do not control for time. If all of the sites in one of their clusters could be demonstrated to be contemporaneous, then they might have a case, but the temporal relationship of these sites is not considered. Because they appear to cluster, they are assumed to be contemporaneous by Munson and Anderson.

An equally plausible interpretation is that these clusters represent repeated exploitation of a resource over time, rather than a catchment isolated in time. That is, the clusters may in fact exist, but do not necessarily represent a time specific exploitation as implied by Munson and Anderson (1982:344-349). In the absence of proof that the sites in a cluster are contemporaneous, the possibility that the cluster was generated by using certain resources over and over again through time can not be rejected.

L. Fredlund's (1981) dissertation was an examination of the Pine Parklands during the Late Prehistoric Period. Much of the work conducted for the coal projects was summarized in her study, and she presents her interpretations for the settlement pattern in the region. Sites located by these surveys have most often been found in the sandstone/rimrock and ponderosa pine ecozones, or on terraces at some distance back from the streams. These are the areas of the greatest ecological diversity, and sites were not common in the open grasslands. Late Archaic sites were frequently associated with water, much more so than Late Prehistoric sites, which were usually located more than 100 meters from the nearest water source. Most sites (and all Late Prehistoric sites) were located on sandy soils, with clay soils being used only infrequently. Fredlund (1981:152-253) suggests that the possible reasons for this are better drainage on sand and the fact that it would be easier to construct such features as firepits or shelters in sandy soil.

During the Late Prehistoric Period, according to Fredlund (1981:161-164), the subsistence pattern was probably collecting-based, as defined by Binford (1980). According to Binford (1980:10) a group of people who are classified as collectors are logistically organized and obtain the necessary resources through the use of specially organized task specific groups. Such a subsistence pattern is characterized by food storage and the use of task groups which are focused on obtaining a given resource. This pattern contrasts with that of foragers, who do not store food and obtain the necessary resources as they encounter them (Binford 1980:5). The hunting pattern utilized within the context of an overall collecting approach for the Late Prehistoric Period is the predator/prey model of D. Fredlund (1973). Fredlund (1981) agrees with Beckes' (1976; 1978) seasonal transhumance model to explain the Late Prehistoric mobility pattern.

The last study to be reviewed is that of Greiser (1981), conducted near Decker (Figure 4). Greiser found that the main influences on site location were view and the presence of water, with most sites being located in the hill and rolling benchland zones. All campsites had either a southern or open exposure, and the larger sites were located in the higher elevations. Early Late Prehistoric (A.D. 250-850) inhabitants of the region most frequently chose elevated mesas for their campsites. After A.D. 1550 sites were more commonly located in the stream valleys. Bison appears to have been a major food resource, while all sizes of game probably were exploited. Greiser (1981:66) suggested that the Decker area was inhabited in the spring and fall. Summers would have been spent in the Bighorn Mountains. Winters would have been spent in areas to the north where there was more shelter from the elements, as the area around Decker is quite open.

Many of these studies contradict one another, and a variety of subsistence-settlement systems have been proposed; however, it is generally accepted that the subsistence system utilized in the area was probably a diversified hunting and gathering economy, at least until the Late Prehistoric Period. One issue of contention is whether or not the seasonal transhumance involved movement to the Bighorn Mountains, or whether it was limited to the Pine Parklands. Lithic source analysis indicates that the Bighorns were utilized, and that people also moved to the northeast, as Knife River Flint is one of the more common exotic raw materials. Keyser and Davis (1981; also Beckes and Keyser 1983:283-285) argue that during the Late Archaic the inhabitants of the Pine Parklands probably stayed within the region. One piece of evidence cited in support of this is the lack of exotic materials in Late Archaic sites. Craig (1983) has documented changing patterns of lithic resource utilization over time at the Kobold site. Porcellanite, the locally available raw material, dominates all assemblages; the Late Prehistoric component (Level IV), however, contains the greatest diversity of material, with the Late Archaic component (Level III) containing the least amount of exotic material. The lithic materials present at the Kobold site do indicate that there was either a movement of some sort to the mountains or contact with groups from the mountains. This issue has yet to be settled, but it is likely that the areas which were exploited changed over time.

Beyond this general subsistence pattern, there does not seem to be much agreement between the studies. Some (Greiser 1981; McLean 1975; Munson and Anderson 1982) found that sites occur more frequently near water, while others (L. Fredlund 1977; Beckes 1976; 1978) found that Archaic sites do not occur near water, while Late Prehistoric sites do. L. Fredlund (1981), however, has suggested exactly the opposite. Other disagreements include the degree to which the various ecozones were utilized and the preference for certain exposures. Such contradictions make it difficult to attempt to present an overall pattern for the Pine Parklands.

A possible explanation for these contradictions was touched upon by Greiser (1981:66) and McLean (1975:119; 1983). This explanation is the great diversity in topography and ecozones which exists in the Pine Parklands as a whole. The Pine Parklands encompass broad, rolling grasslands, isolated buttes, and steep sided, heavily forested ridges. Such diversity can be seen quite easily on the Ashland District, which is itself more heavily forested than the areas around Colstrip or Decker. The settlement pattern in any given area will depend on the local conditions, and therefore any discussion of the region as a whole must consider this diversity. A likely explanation for the differing results obtained by the various surveys in regards to site locations is that this ecological diversity has necessitated the use of different strategies in each of the given areas. Factors which affect site locations near Decker are probably different than those in the Ashland area. For this reason, discussions of site distribution for the region as a whole must be generalized, taking into account the local differences. The present study is focused on the area around Ashland.

CHAPTER 5

AN ANALYSIS OF SITE DISTRIBUTIONS ON THE ASHLAND RANGER DISTRICT

METHODS

This chapter is an analysis of the distribution of archaeological sites on the Ashland Ranger District. Data for this study were obtained by examining the records available at the District headquarters in Ashland, MT. These records include site forms, topographic maps, soils maps, and data on mapped ecozones. For multicomponent sites (of which there are 11), each component will be treated as if it were a separate site. Several possible variables which could potentially influence site locations have been chosen for this study. A secondary goal of the study is to examine the possibility of developing a predictive model for site locations to be used on the District. Many of the variables chosen were selected because of their potential for use in a predictive model. The following variables were selected for use in this study: slope, soil type, ecozone, distance to water, elevation, landform setting, and aspect. In addition to these variables, changes over time in regards to each of these variables were investigated. Chronological age and cultural complex was also recorded for this reason. Each of the variables is described below.

Slope

Slope should be a major factor influencing the location of most sites. It is not likely that campsites or occupation sites would be located on steep slopes. For example, Williams et al. (1973) found that all sites located by the Reese River Ecological Project were located on a slope of less than 20%. The slope for each site recorded on the District was measured from 7.5 min. USGS topographic maps. Slope percentage was determined by dividing the rise in elevation by the horizontal distance and multiplying that number by 100.

Distance to water

The availability to water is often considered to be an important factor determining site location. Blakeslee and Rohn (1986:89-96) found that proximity to reliable water sources could be used to predict the locations of all habitation sites recorded by the Hillsdale Lake Project in northeast Kansas. Williams et al. (1973) also used proximity to water to predict site locations. Previous studies in the surrounding area have obtained mixed results in regards to site locations and proximity to water.

One major problem associated with using distance to water for examining site location patterns is changes in local hydrology over time. Only one creek on the District (Otter Creek) presently contains water year round. The only reliable sources for water are the many springs located on the District. Many of these springs have been developed for livestock and flow into stock tanks, thus reducing the amount of flowing water which would normally be found on the District. Existing springs may not have been flowing in the past, and previously flowing springs may no longer exist. Many of the creeks in the area contain water in the spring as a result of melting snow. They may also contain water following a heavy rain. Such sources can not, however, be determined by examining a topographic map and they may not have been reliable from year to year. Snow melt and heavy rains may have been important water sources, but because of their ephemeral nature, it is not possible to consider them in this study.

Another factor potentially affecting the reliability of studies using current water sources in the Pine Parklands is fire suppression. Over the last 100 years all fires have been actively suppressed, resulting in a large increase in the number of trees found in the area. Ponderosa pine, the dominant species, absorb a very large quantity of water, and a large increase in the number of trees could potentially affect the availability of ground water, thus drying up some springs. For these reasons, distance to water must be used with some caution for determining site location patterns.

Distance to water is measured to the nearest spring or to Otter Creek, the only creek on the District which contains water year round. Different measures have been used to determine proximity to water. Greiser (1981:64-65) considers a site less than 0.5 miles from a water source to be close to water. L. Fredlund (1981:147, 151) uses 100 meters as the dividing line for determining proximity to water, while in contrast, Williams et al. (1973) considered 1,000 meters or less to be close to water. In this study no arbitrary distance will be used to determine whether or not a site is close to water. A variable like this is quite likely subject to cultural differences. The distance to the nearest source of water for all sites will be determined and these distances will be examined to determine if there are any patterns.

Elevation

Elevation is another factor which has been considered to be important for site locations in the Pine Parklands. Beckes (1976) and Munson and Anderson (1982) hypothesized that Late Archaic sites were located in higher elevations and Late Prehistoric sites in lower elevations. The average elevation of each site was obtained from USGS topographic maps. It should be noted that although previous studies of the Pine Parklands made a point of considering variation in elevation, the variation which is present is minimal when compared to that found in the mountains. Distinct changes in vegetation related to elevation do not occur in the Pine Parklands the way they do in areas such as the Pryor Mountains (Komberec personal communication 1989).

Topographical Setting

Local landforms are another potential factor influencing site locations. Hill (1988) found that the utilization of the various topographical settings in the Little Missouri Badlands varied over time and between different cultural complexes. The topographical categories utilized in this study are: ridges, terraces, isolated buttes, saddles, and upland prairies.

Aspect

Aspect, the direction in which a site faces, has been suggested to be an important factor for determining site locations in the Pine

Parklands by several researchers. Greiser (1981) found that most sites located by her survey near Decker, MT. had a southern or open exposure. L. Fredlund (1977) obtained similar results. Direction of exposure was determined by examining USGS topographic maps. The directions utilized were the cardinal and semi-cardinal directions, and an open exposure. An open exposure is one in which no one aspect can be defined. For example, a butte-top with a 360 degree view or a site situated in the center of the upland prairie would be assigned an open view.

Soil Type

Soil type is a variable which may be important for determining site locations. In areas where horticulture is practiced, the distribution of arable land is an important factor for determining site locations (Dean 1984:17-18). It is not clear to what extent the distribution of soils would affect hunter-gatherer site distributions. The type of soil present can affect the habitat type present, which could influence site location. L. Fredlund (1981:127-129; 152-153) has suggested that sites in the Pine Parklands are most frequently located on sandy soils, with fewer sites occurring on loam or clay. Most studies have not considered this variable. There are 86 soil mapping units in the Powder River Area (Parker et al. 1971) and these will be used in this study. The Powder River Area defined by Parker et al. (1971) includes all of Powder River County and that part of Rosebud County which includes the Ashland District (see Figure 2).

Ecozone

A majority of the studies done in the Pine Parklands focus on the influence of the ecozones present in the area and their hypothesized effects on site location. Beckes (1976), D. Fredlund (1973), L. Fredlund (1981), McLean (1975), and others have all proposed that there is a significant correlation between ecozone type and site locations. Studies in other regions have also shown a strong relationship between floral resources and site locations (for example, Hill 1988; Williams et al. 1973).

A total of ten ecozones have been defined and mapped for the Ashland District (Beckes and Keyser 1983:57-66; Taylor 1976). Several different ecozone definitions have been used in the Pine Parklands. The ecozones utilized in this study are somewhat different than those used by Beckes (1976) and McLean (1975). Ecozones used in this study are those which currently are used on the District by the other resources and replaced those used by Beckes and McLean. The two systems are compatible. One of the primary reasons for selecting these ecozones was the fact that they have been mapped for the entire District and they are quite easy to use.

As was the case with water sources, ecozones must be used with caution. The ecozones utilized are characterized by existing plant communities, which are probably different from those existing in the past. Over the last 100 or so years there has been a change in the environment of the Pine Parklands (L. Fredlund 1981:129-130). This has been caused by overgrazing, hunting, plowing, road construction, rodent and predator control, and forest/wild fire suppression. These activities have resulted in changes in plant and animal communities and a lowering of the water table. Natural climatic changes have also occurred which may have changed the environment (Beckes and Keyser 1983:9-14; Greiser 1985:10-24). Whether or not the ecozones presently found on the Ashland District correspond to the previous environment, the ecozones may still be useful for predicting site locations.

The following discussion of the ecozone types found on the Ashland District is taken from Beckes and Keyser (1983:57-66), Taylor (1976), and Komberec (personal communication 1989). These definitions take into consideration many of the variables considered separately in this study. An example of ecozone distributions on the Ashland District is presented in Figure 5.

(1) Creek Bottom-Mixed Deciduous Tree/Shrub

This ecozone consists of level and gently sloping floodplains, stream banks, and stream channels. Roughly 2,000 acres or 0.4% of the District land is contained in this ecozone. The Creek Bottom ecozone often occurs as 'stringers' or draws which branch from the main streams and cut through other ecozones. This ecozone consists of an overstory of woody species, small trees and shrubs, and an understory of various species of forbs. The Creek Bottom ecozone is an important wildlife habitat and watershed. Typical vegetation includes: green ash, box elder, plains cottonwood, chokecherry, American plum, western wild rose, Kentucky bluegrass, and golden pea. Animal species commonly found in this ecozone include: white-tailed deer, sharp-tailed grouse, mountain cottontail, raccoon, muskrat, beaver, goldfinch, and black-capped chickadee. This would have been the most productive in terms of natural resources of all the ecozones. Soils are dark colored

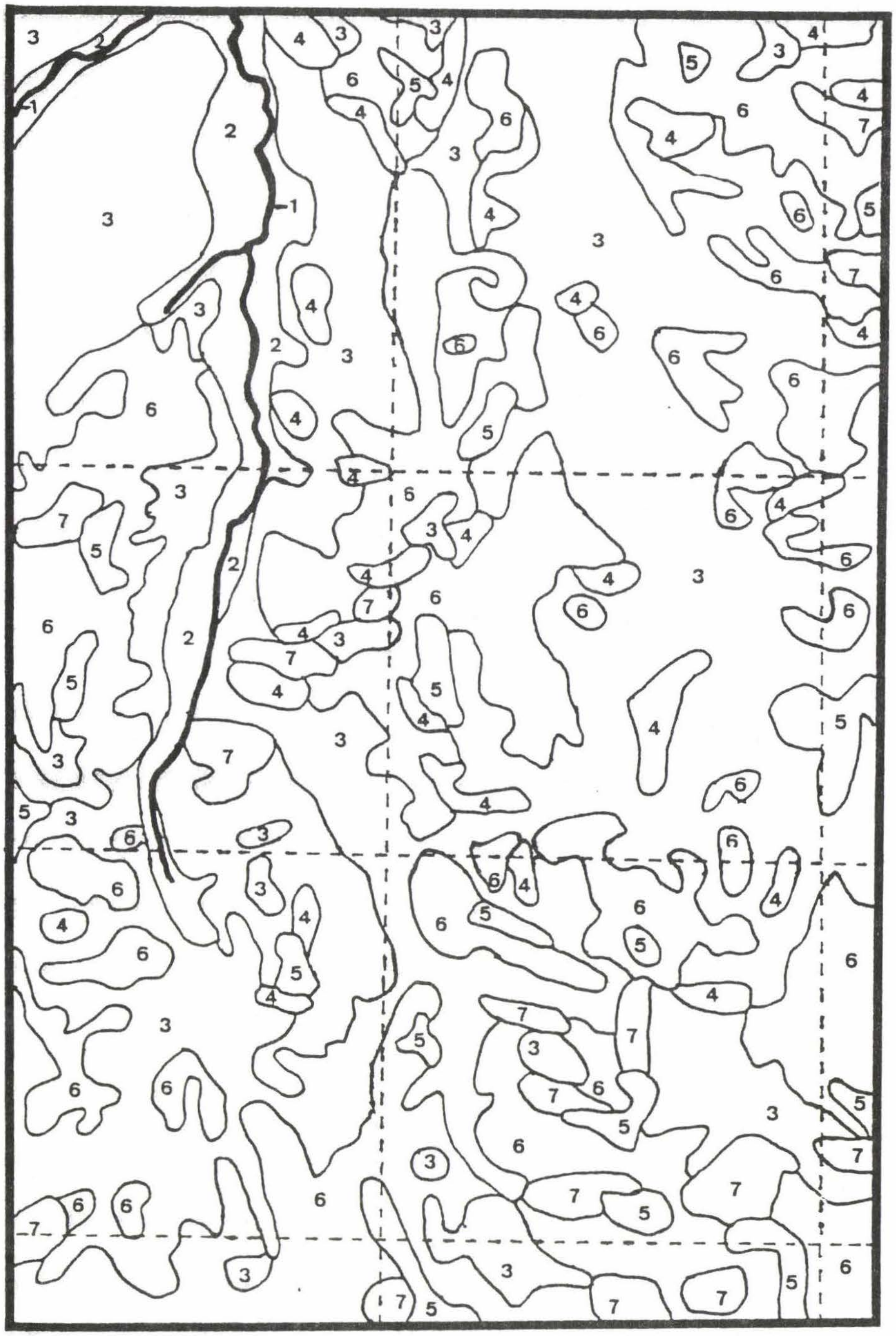


FIGURE 5
Example of ecozone distributions on Ashland District.
Numbers refer to ecozones described in text.
Dashed lines are section lines.

unconsolidated silt loam to light colored loam, silt loam, and fine sandy loam. These soils have a moderate rate of permeability.

(2) Creek Terrace and Lower Slope-Fan Terrace

This ecozone includes the flats above the current floodplains, the sloping alluvial fans, and the steeper toe slopes along the drainages. A total of 74,778 acres or 14.9% of the District land is included within this ecozone. Vegetation is typically a shrub-grass association, with dominant species including: silver sage, grease-wood, big bluestem, green needlegrass, blue gramma, yarrow, and western wheatgrass. Berries would have been common in season. Typical fauna include: coyote, striped skunk, least chipmunk, badger, white-tailed deer, robin, pinyon jay, and vesper sparrow. Big game are very common in this ecozone. This is the most productive ecozone after Creek Bottoms, to which it is closely related. Soil types are loams, silt loams, and silty clays. These vary in many aspects, such as depth, texture, salinity, permeability, and water storage capacity.

(3) Open Hillsides

The Open Hillsides ecozone includes the gently to moderately rolling hilly prairie and makes up 93,366 acres or 18.6% of the District land. This ecozone is characterized by a lack of trees and sloping ground. Dominant vegetation in this ecozone is a mixture of shrubs, grasses, and sedges. Several plant species with edible roots occur in this ecozone. Common species found in the Open Hillside ecozone include: little bluestem, side-oats gramma, Idaho fescue, sedge, arrowleaf balsamroot, snowberry, western wheatgrass, bluebunch wheatgrass, prairie sandreed, and cudweed sagebrush. Fauna which utilize this ecozone (or may have in the past) include: coyotes, badgers, mule deer, kestrel, red-tailed hawk, western meadowlark, chipping sparrow, poor will, lark sparrow, bison, and possibly big horn sheep. This ecozone is less productive than the Stream Terrace ecozone, but is more productive than the higher elevation ecozones. Soils vary quite a bit, and include fine textured silt loams and silty clay loams.

(4) Scoria-Sandstone Outcrop

This ecozone includes scoria, sandstone, and shale outcrops and escarpments, and steep dissected slopes. Roughly 56,911 acres, or 11.3% of the District is classified as belonging to this ecozone, which usually occurs as bands or patches on steep, rocky slopes. Shrub communities are the dominant type of vegetation, with some grass and forbs also being present. Common species include: skunkbrush sumac, Rocky Mountain juniper, creeping juniper, little bluestem, blue-bunch wheatgrass, winterfat, and phlox. A greater number of forbs and grasses are found on the north-facing slopes, which are more mesic. Several of the species found in this ecozone have edible roots. A variety of animal species commonly use or may have used this ecozone, including: golden eagles, prairie falcon, turkey vultures, white throated swifts, rock wrens, bobcats, pigmy rabbits, mule deer, and possibly big horn sheep. This ecozone has the greatest amount of floral and faunal diversity of any on the District. Soils are variable, ranging from clayey loams to silty loams to sandy loams.

(5) Grassland Parks

This ecozone includes the upper slopes and rounded hilltops. Roughly 55,056 acres, or 11.0%, of the District is classified as Grassland Parks. These usually occur in large blocks of land. A wider variety of grass and forbs can be found in this ecozone than in the Open Hillside ecozone because the Grassland Parks are more mesic. Several plant species with edible roots occur in this ecozone. Common floral species include: Idaho fescue, green needlegrass, western wheatgrass, big bluestem, little bluestem, side-oats gramma, bluebunch wheatgrass, sedge, yarrow, and silver sage. This ecozone is usually surrounded by growths of ponderosa pine. Typical wildlife found presently or in the past in this ecozone include: mule deer, white-tailed deer, coyote, porcupine, sharp-tailed grouse, elk, and bison. The Grassland Parks ecozone has the second greatest amount of floral and faunal diversity of any ecozone on the District, second only to the Scoria Outcrop ecozone. Soils are well drained silt loam and loam.

(6) Dry Slope Ponderosa Pine

The Dry Slope Ponderosa Pine ecozone includes the gently to steeply sloping, sparsely timbered slopes. Small areas of exposed sandstone and shale outcrops occur within this ecozone. A total of 137,238 acres or 27.3% of the land on the Ashland District is classified as Dry Slope Pine. The Dry Slope Pine ecozone is very similar to the Grassland Parks ecozone, with the addition of a open canopy of ponderosa pine being the primary difference. This ecozone consists of a sparse scattering of ponderosa pine with a grass understory. Typical grass species include: big and little bluestem, skunkbrush, Idaho fescue, and sedge. Shrubs, such as chokecherry, commonly occur in this ecozone. Fauna commonly found in this ecozone include: white-tailed deer, elk, coyote, least chipmunk, red-breasted nuthatch, red-tailed hawk, and kestrel. Soils vary from silty loams to slaty loams.

(7) Moist Slope Ponderosa Pine

This ecozone consists of the heavily wooded, moist, north-facing slopes and timbered uplands. Approximately 23,607 acres (4.7%) of the District is classified as this ecozone. This ecozone is characterized by a closed canopy of ponderosa pine with a shrub understory and is an important watershed and wildlife habitat. Typical vegetation includes: ponderosa pine, chokecherry, snowberry, serviceberry, Oregon grape, Idaho fescue, ticklegrass, bedstraw, and poison ivy. A variety of wildlife is found in this ecozone, including: goshawks, white-winged juncos, hairy woodpeckers, ruby-crowned kinglets, tree swallows, coyote, porcupine, red squirrel, least chipmunk, mule deer, white-tailed deer, and elk.

(8) Upland Prairie - Grassland
(9) Upland Prairie - Sagebrush
(10) Upland Prairie - Bunchgrass

Beckes and Keyser (1983:65-66) included these three ecozones under one heading because of their close similarity. Most of the 59,167 acres, which account for 11.8% of the District land, can be classified as Upland Prairie - Grassland (44,633 acres). Komberec (personal communication 1989) suggests that Upland Prairie - Sagebrush is essentially the same as the Grassland and that it has only developed in the last century as a result of human interference with the normal plant communities. These ecozones consist of the level to gently rolling upland benches (slopes of 0-20%), gentle to strongly rolling swales and benches (slopes of 20-40%), and the moderate to steeply rolling slopes and dry scoria ridges (slopes of greater than 40%). Typical plant species include: green needlegrass, western wheatgrass, big bluestem, prairie sandreed, big sagebrush, silver sage, and bluebunch wheatgrass. Common wildlife found in these ecozones now or in the past include: antelope, coyote, mountain cottontail, white-tailed jackrabbit, swift fox, thirteen-lined ground squirrel, western or prairie rattlesnake, bison, elk, and a wide variety of bird species. Soils are primarily dark loams and clay loams, but silty loams and slaty loams occur.

Taylor (1976:46) suggests that the above ten ecozones can be combined into four categories for gross resource utilization planning or for mapping. These categories are: Forest (ecozones 6 and 7), Shrubland (ecozones 1 and 9), Mesic Grassland (ecozones 2, 5, 8, and 10), and Xeric Grassland (ecozones 3 and 4). Komberec (personal communication 1989) suggests that ecozone 9 (Upland Prairie - Sagebrush) be placed in the mesic grassland classification and that the Shrubland be renamed Riparian. Overall the mesic grasslands are the most productive (T. Williams personal communication 1989), but the xeric grasslands are the primary winter habitat for big game on the Ashland District (Komberec personal communication 1989).

RESULTS

The results of the study of site locations are presented below by each of the variables which was examined. This first part is a discussion of the overall distribution of sites in the District, including all sites regardless of chronological placement. Following this, the chronological placement of the sites will be considered in relation to the variables used in this study.

Site Location by Variable

Slope

Slope (Table 1) appears to be an important factor in site locations. A majority of the recorded sites on the Ashland District are situated on slopes of less than 30%. Only 44 of the 484 sites, or 9.9%, occur on slopes of greater than 30%. Of these 44 sites, four are quarry sites and three are rock art sites. These are specialized sites which tend to be located in areas with steep slopes. Many of the remaining 37 sites may not be located on steep slopes if the site specific topography is taken into consideration. For example, 20 of these sites are located on butte-tops. The sides of these are quite steep, while the top is usually level, but it is often not possible to accurately measure the slope of this feature because of the scale of the map. Nine of the other sites are located on features such as benches or the edges of ridges which appear to be steeper than they actually are when measured from a map. This leaves eight sites for which their location on a steep slope (>30%) can not be accounted for.

TABLE 1. Site Location by Slope

Percent Slope	# of Sites	% of Sites
> 50	4	0.8
> 40	18	3.7
> 35	34	7.0
> 30	44	9.9
> 25	75	15.5
< 25	409	84.5

TABLE 2. Site Location by Aspect

Aspect	# of Sites	% of Sites
North	48	9.9
Northwest	12	2.5
Northeast	41	8.5
West	63	13.0
East	49	10.1
South	85	17.6
Southwest	24	5.0
Southeast	19	3.9
Open	143	29.6

TABLE 3. Site Location by Topographic Setting

Landform Setting	# of Sites	% of Sites
Upland	30	6.2
Butte	35	7.2
Saddle	35	7.2
Ridge	175	36.2
Terrace	209	43.2

Overall, however, it can be stated that an overwhelming majority of the sites are located on a slope of less than 30%.

Aspect

Sites on the Ashland District can be found with almost any aspect (Table 2). By far the most common aspect is an open aspect. Nearly 30% of the sites are not limited to any one direction of view. Such sites are most commonly located on ridges. Other types of locations which commonly have an open view are saddles, butte tops, and the upland prairies. The next most common aspect is a southern one, accounting for approximately 18% of the sites. No one direction clearly dominates and sites can potentially face any direction.

Setting

Five types of topographic setting (Table 3) were defined for the Ashland District, and two of these clearly dominate site locations - terraces and ridges. Nearly 80% of the sites on the District are found on either a terrace (43.2%) or a ridge (36.2%). The other settings have approximately an equal distribution of sites, with roughly seven percent of the sites each on buttes and saddles and six percent on upland prairies.

Distance to water

As was discussed in the methods section, using distance to water for evaluating site locations presents some problems as a result of changes in hydrology over time. With this caution in mind, it can be stated that in general, proximity to water does not appear to be a

TABLE 4. Site Location by Distance to Water

Distance to Water	# of Sites	% of Sites
≤ 500 feet	105	21.7
≤ 1000 & > 500	57	11.8
≤ 1500 & > 1000	49	10.1
≤ 2000 & > 1500	30	6.2
≤ 2500 & > 2000	20	4.1
≤ 3000 & > 2500	22	4.6
≤ 3500 & > 3000	24	5.0
≤ 4000 & > 3500	16	3.3
≤ 4500 & > 4000	30	6.2
≤ 5000 & > 4500	20	4.1
≤ 5500 & > 5000	18	3.7
≥ 5500	93	19.2

TABLE 5. Site Location by Soil Type

Soil Type*	% of land	# of Sites	% of Sites
Ca	10.4	98	20.3
Mw	10.3	70	14.5
Rt	1.9	64	13.2
Fm	1.5	61	12.6
Mg	16.5	50	10.3
Rs	1.9	23	4.8
Mt	4.1	20	4.1
Fk	0.7	17	3.5
El	3.6	14	2.9
Ru	0.9	11	2.3
Ec	5.3	8	1.7
Fl	0.3	8	1.7
All Others	52.6	40	8.3

* see text for descriptions of soil types

crucial factor influencing site locations (Table 4). While 21.7% of the sites are located 500 feet or less from a spring, 19.2% are located greater than 5,500 feet from the nearest spring. Overall, 43.6% of the sites are found 1,500 feet or less from a spring, 37.2% are located between 1,500 and 5,500 feet from a spring, and the remaining 19.2% are found at distances of greater than 5,500 feet from the nearest spring. This distribution likely is influenced by the difficulty of determining water sources and is probably not an entirely accurate representation of the influence of water on site locations.

Soils

A total of 86 different soil mapping units have been defined for the area, 30 of which contain sites. Five soil units (Table 5) account for 70.9% of the sites on the District. These units are designated by the symbols Ca, Fm, Mg, Mw, and Rt. An additional seven soil mapping units account for a further 20.9% of the sites. These soil units are: Ec, El, Fk, Fl, Mt, Rs, and Ru. The final 8.3% of the sites are located on 18 different soil mapping units. All of these soil mapping units are loams, primarily silt loam, but with some clayey loams and slaty loams. Another feature common to all of these units is that they are currently used for grazing. Timber production is not a factor on any of them. Following is a description of these twelve soil mapping units. The descriptions are taken from Parker et al. (1971) and are presented in their order of importance for site locations.

Ca - Cabba association, 15-50% slopes

Occurs in uplands and consists of three soil types - Cabba silt loam, Cabba clay loam, and Midway clay loam. Also includes shale outcrops and sandstone ledges. These are well drained, moderately permeable, and show a medium rate of water intake. Cabba association soils experience a medium to rapid rate of runoff and the erosion hazard is moderate unless the soils are unprotected, in which case it is severe. Few trees grow on these soils.

Mw - Midway and Elso rocky soils, 35-75% slopes

Includes Midway rocky clay loam, Elso silt loam, and silty, clayey, and sandy shale and sandstone outcrops. These outcrops are the dominant feature of this mapping unit. Permeability is slow to moderate and these soils are well drained, with very rapid runoff. There is a severe erosion hazard associated with this mapping unit.

Rt - Ringling-Cabba association, 15-50% slopes

Includes equal parts of Ringling slaty loam and Cabba silt loam. The Ringling soils have a slow to medium runoff rate while the Cabba soils have a rapid runoff. Few trees grow on these soils. Moderate erosion hazards exist in this soil unit.

Fm - Farland and Havrelon soils, 4-8% slopes

This soil unit consists of Havrelon silt loam and Farland silt loam situated on narrow flood plains and in developing alluvial fans. These are deep, well drained, and moderately permeable soils with slow to medium rates of runoff. The primary vegetation is grasses.

Mg - Midway-Elso association, 8-35% slopes

Consists of Midway clay loam and Elso silt loam. Elso soils are found on narrow divides, ridge tops, knolls, and the upper parts of the sides of valleys, while Midway soils occur on the lower valley sides and foot slopes. These soils have slow to moderate permeability and medium to rapid runoff rates. Erosion hazards are moderate to severe.

Rs - Ringling slaty loam, 25-50% slopes

This soil type is found in the uplands and has a rapid permeability and high water intake rate. The erosion hazard is low and there is a slow to medium runoff rate. Clinker outcrops are common within this unit.

Mt - Midway-Thurlow association, 8-15% slopes

Includes Midway clay loam and Thurlow silty clay loam. This soil unit is found on divides in the uplands and on foot slopes. The permeability is slow, with a moderate runoff rate and moderate erosion hazard.

Fk - Farland-Cabba association, 8-20% slopes

Primarily Farland silt loam found on short side slopes and swales with some Cabba silt loam on tabular divides and ridges. These are well drained soils.

El - Elso silt loam, 15-45% slopes

Similar to Ec (see below) except that it occurs on steeper slopes and in thinner layers. As a result, there is a rapid runoff and a severe erosion hazard.

Ru - Ringling-Relan association, 6-25% slopes

Consists of equal amounts of Ringling slaty loam on narrow divides, ridges, and steep knobs, and Relan loam on swales, lower foot slopes, and drainage ways. The runoff rate is slow to medium with a moderate erosion hazard. Clinker outcrops are common.

Ec - Elso silt loam, 8-15% slopes

Elso silt loam is found primarily on ridges, foot slopes, and narrow tabular divides in the uplands. There is a medium rate of permeability and a medium runoff.

Fl - Farland-Rock land association, 0-6% slopes

This soil unit is made up of Farland silt loam with some rock land. Occurs on high terraces and contains sandstone outcrops 10 to 20 feet wide and 200 to 800 feet long. Description of Farland soils is the same as that for Fk.

Elevation

Archaeological sites on the Ashland District can be found at all elevations (Table 6). Elevations on the District range from approximately 2,900 feet along the Tongue River to 4,400 feet. Most sites, however, tend to be found in the middle elevations. The

TABLE 6. Site Location by Elevation

Elevation	# of Sites	% of Sites
≥ 4000	79	16.3
< 4000 & ≥ 3700	120	24.8
< 3700 & ≥ 3400	200	41.3
< 3400 & ≥ 3000	84	17.4
< 3000	1	0.2

TABLE 7. Site Location by Ecozone.

Ecozone	% of land	# of Sites	% of Sites
1. Creek Bottom	0.4	0	0.0
2. Creek Terrace	14.9	97	20.0
3. Open Hillsides	18.6	125	25.8
4. Scoria Outcrop	11.3	60	12.4
5. Grassland Parks	11.0	31	6.4
6. Dry Slope Pine	27.3	84	17.4
7. Moist Slope Pine	4.7	10	2.1
8. Prairie-Grassland	-	49	10.1
9. Prairie-Sagebrush	-	10	2.1
10. Prairie-Bunchgrass	-	4	0.8
Upland Prairie - All	11.8	63	13.0
No Assigned Ecozone	-	14	2.9

TABLE 8. Chronological Placement of Sites

Chronological Period	# of Sites	% of Dated Sites	% of Sites
Paleoindian	13	14.1	2.7
Early Archaic	3	3.3	0.6
Middle Archaic	11	12.0	2.3
Late Archaic	33	35.9	6.8
Late Prehistoric	32	35.2	6.7
No Known Age	392	-	81.2

greatest number of sites can be found between 3,400 and 3,700 feet. Next most frequently used are the elevations between 3,700 and 4,000 feet. There is a slight preference lower elevations, i.e., those less than 3,700 feet.

Ecozone

As can be seen from Table 7, archaeological sites can be found in all ecozones present on the Ashland District except for one (Creek Bottom). The Creek Bottom ecozone (1) only accounts for 0.4% of the land on the District. It is also not likely that there would be much visible evidence left by utilization of this ecozone. Evidence which might have originally been deposited was almost certainly removed by water or deeply buried under sediment.

This does not mean that this ecozone was not utilized. The percentage of sites located within an ecozone does not necessarily reflect the intensity of the utilization of that ecozone. For example, the Creek Bottom ecozone was probably heavily exploited for the floral and faunal materials found there (Beckes and Keyser 1983:58), but the nature of that use would not leave much material evidence. Camp sites would most likely have not been set up in a creek bottom.

Many researchers working in this region have hypothesized that the past inhabitants preferred to use certain ecozones. One way to examine this is to compare the percentage of the total number of sites in a given ecozone with the percentage of the District that is occupied by that ecozone. If ecozone A accounts for 10% of the land, but 30% of the sites, then it is likely that this ecozone was preferred for one reason or another. However, if ecozone A accounts for 20% of the land

and 20% of the sites, the preference for that ecozone is not as clear. A random utilization of the environment could account for such a distribution.

A comparison of the distribution of sites to the amount of land assigned to each ecozone reveals that some ecozones were utilized more heavily than others. The Creek Terrace ecozone (2) (20.0% of the sites, but 14.9% of the land area) and the Open Hillside ecozone (3) (25.8% of the sites on 18.6% of the land) appear to have been utilized much more heavily than the other ecozones. Three of the ecozones appear to have been utilized less frequently than would be expected based on their frequency on the District. These eoczones are: Grassland Parks (5), 6.4% of the sites, 11.0% of the land; Dry Slope Ponderosa Pine (6), 17.4% of the sites, 27.3% of the land; and Moist Slope Ponderosa Pine (7), 2.1% of the sites, 4.7% of the land. The remaining two ecozones, Scoria-Sandstone Outcrop (4), with 12.4% of the sites on 11.3% of the land, and Upland Prairie (8, 9, and 10), with 13.0% of the sites on 11.8% of the land, may have been slightly favored, but not nearly as much as the Creek Terrace and Open Hillsides ecozones.

As was discussed in the section on methods, these ten ecozones can be combined into four categories. These categories are mesic grasslands (ecozones 2, 5, 8, 9, 10), xeric grasslands (ecozones 3 and 4), forests (ecozones 6 and 7) and riparian (ecozone 1). No sites occur in the riparian category. Overall, 19.5% of the sites are found in forested areas. The mesic grasslands and xeric grasslands are used with essentially the same frequency - 39.5% of the sites are in mesic grasslands while 38.2% are in xeric grasslands.

Chronology

The biggest factor which needs to be considered when looking at the chronological relationships of sites on the Ashland District is the fact that 81% of the recorded sites can not be assigned to a time period (Table 8). There is no way of knowing if each cultural complex is represented in the same proportion by these sites as it is by the sites which can be assigned dates. It is possible that one group of people curated diagnostic materials to a much greater extent than did another group. This would result in the first group being under-represented in the archaeological record when compared to the second group. Another possible factor is that one group may have exploited the region in such a way as to leave a large number of small sites with little diagnostic material, while another group left a few sites with a large amount of diagnostic material. The settlement-subsistence strategies utilized by past inhabitants of the Pine Parklands can have a great affect on the types of sites which appear in the archaeological record. This factor must be kept in mind when discussing changes in land usage in the Pine Parklands over time. The relationships of sites to the variables according to time are presented in Tables 9 through 13.

Paleoindian Period

Paleoindian Period sites account for 14.3% of the sites which can be assigned to a chronological period. Seven different complexes are represented, with Agate Basin being the most common and Cody and Hell Gap following close behind. The Creek Terrace Ecozone (2) was the most

TABLE 9. Aspect by Time.

Time	N	NE	NW	W	E	S	SE	SW	OPEN
P*	-	1	-	2	-	2	-	-	8
EA	-	1	-	-	-	1	-	1	-
MA	1	1	1	2	-	2	1	-	3
LA	2	2	1	2	4	8	2	4	7
LP	-	5	-	3	4	4	2	1	13

TABLE 10. Topographic Setting by Time.

Time	Upland	Saddle	Butte	Ridge	Terrace
P	1	2	1	4	5
EA	1	-	-	-	2
MA	-	2	1	-	8
LA	1	1	2	8	20
LP	4	-	7	12	9

TABLE 11a. Distance to Water by Time.

Time	≤500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000
P	3	-	3	-	1	-
EA	2	-	-	-	-	-
MA	6	1	-	1	-	-
LA	12	7	1	1	-	-
LP	3	2	5	3	2	-

* P = Paleoindian, EA = Early Archaic, MA = Middle Archaic,
LA = Late Archaic, LP = Late Prehistoric

TABLE 11b. Distance to Water by Time.

Time	3000-3500	3500-4000	4000-4500	4500-5000	5000-5500	≥5500
P	3	-	-	1	-	2
EA	-	-	-	-	-	-
MA	1	-	-	-	1	1
LA	-	-	2	2	1	6
LP	4	1	3	1	1	7

TABLE 12. Elevation by Time.

Time	<3000	3000-3400	3400-3700	3700-4000	≥4000
P	-	2	5	5	1
EA	-	-	2	-	1
MA	-	-	6	3	1
LA	-	7	13	8	6
LP	-	4	10	8	10

TABLE 13. Ecozone by Time.

Time	2~	3	4	5	6	7	8, 9, 10	NA
P	4	2	2	2	-	-	1	2
EA	-	1	-	-	-	-	1	1
MA	3	2	-	2	1	-	2	1
LA	10	8	2	1	5	-	6	1
LP	6	8	5	3	4	-	5	1

* P = Paleoindian, EA = Early Archaic, MA = Middle Archaic,
LA = Late Archaic, LP = Late Prehistoric

~ Numbers are those assigned to each ecozone in the text.

heavily utilized ecozone, containing 31% of the sites. Most sites (N=7) occur in mesic grasslands, and no sites have been found in forested ecozones. Terraces and ridges were the most common settings for sites and an open aspect was highly favored (61.5% of the sites). Paleoindian sites appear to be spread fairly evenly through the elevations, and are most commonly located greater than 1000 feet away from a water source.

Early Archaic Period

Only three Early Archaic sites have been recorded on the Ashland District, all of which are assigned to the Oxbow Complex. With such a small number of sites, no patterns can be discerned.

Middle Archaic Period

Middle Archaic Period sites account for 12.1% of the sites on the District. Such sites are found most frequently in the Creek Terrace Ecozone (2), which accounts for 27% of the sites, with Open Hillsides (3), Grassland Parks (5), and Upland Prairie (8) being equally often used (18%). Mesic grasslands were by far the most heavily used, with very few sites being located in the xeric grasslands or forested areas. Sites were most frequently found on terraces (73%) and within 1000 feet of water (64%). The aspect and elevation do not appear to have been important, although no sites were located below 3,400 feet. It appears that the Middle Archaic inhabitants of the region preferred the open areas - creek terraces, hillsides, open grasslands. No sites were found in the Scoria-Sandstone Outcrop Ecozone (4). Proximity to water does appear to have been a factor in site locations.

Late Archaic Period

In general, Late Archaic Period sites occur most frequently in the Creek Terrace (2), Open Hillside (3), and Upland Prairie (8, 9) ecozones. Sites were found throughout all elevations, but somewhat more frequently in the lower elevations. Late Archaic sites more commonly occur within 1,000 feet of a good water source (59%). Mesic grasslands are by far the most heavily utilized areas (54.8%). Xeric grasslands are much less frequently used (32.3%), while forested areas are rarely utilized (12.9%). No single aspect takes precedence over the others, although one half of the sites have a generalized southern (south, southwest, or southeast) exposure. Terraces are by far the most common locations for sites, with ridges being the next most frequent. Sites also occur on buttes, saddles, and in the upland prairie.

Late Prehistoric Period

Sites assigned to the Late Prehistoric Period are the second most common type following Late Archaic sites. In contrast to earlier time periods, the Open Hillside ecozone (3) was utilized much more heavily than previously. The Creek Terrace ecozone (2) is utilized equally with the Scoria-Sandstone Outcrop Ecozone (4). This last ecozone is utilized more heavily during the Late Prehistoric Period than during any time previously. The Upland Prairie (8, 10) and Dry Slope Ponderosa Pine (6) ecozones are also utilized, the Dry Slope Ponderosa Pine ecozone more so than in the past and the Upland Prairie ecozone less so than previously.

Sites are most frequently located on ridges, although terraces and buttes often contain sites. This is the only time period during which buttes are occupied to any extent. Butte top occupations account for 23% of the Late Prehistoric sites, but less than 10% of the sites in each of the other periods. No Late Prehistoric Period sites are located on an upland setting. Late Prehistoric Period sites can be found in all elevations, but more commonly in the higher elevations. The most dominant aspect is an open one, accounting for 42% of the sites, with a general eastern direction (east, northeast, southeast) being the next most common. In regards to distance to water, 90% of the Late Prehistoric sites are greater than 1,000 feet from the nearest steady water source. More Late Prehistoric Period sites are located on slopes of greater than 30% than sites of any other period. This may be related to the heavier utilization of butte top locations.

CONCLUSIONS

As can be seen from the above discussions, the variables considered in this study appear to differ in their influence on site locations. Not only is there variation between the different variables, but there is also change over time for each individual variable. The importance of each variable for predicting site locations is assessed in the next chapter and a predictive model for site locations will be developed. This model will be tested using data which was not used in the current chapter. An overall summary of land use patterns on the Ashland District will be presented once this model has been tested.

CHAPTER 6

A PREDICTIVE MODEL FOR SITE LOCATIONS ON THE ASHLAND RANGER DISTRICT

The development and use of predictive models for locating archaeological sites has increased in frequency over the last 10 years (Kohler 1988; Kohler and Parker 1986; Tainter 1984). As with many of the new developments in archaeology over the last 30 years, the use of such models has met with a great deal of heated debate (Berry 1984; Klesert 1987; see especially the exchanges in Tainter 1984). These debates have concerned all aspects of predictive models - including the way in which models are used, the methods used to develop models, and the accuracy of such models. Several different types of predictive model have been developed.

The second part of this study has two parts: developing a predictive model based on the results of the settlement pattern study presented in Chapter 5, and testing that model with new data obtained by a recent survey conducted on the Ashland District.

PREDICTIVE MODELS

Predictive models have long been used by archaeologists in their work, but it is in the last 10 to 15 years that the use and development of such models has been made explicit (Kohler and Parker 1986:397-398). One of the driving forces behind this development was the need of all federal agencies to conduct cultural resource inventories prior to any ground disturbing activities. Agencies such as the Bureau of Land Management and the Forest Service, with millions of acres to inventory, hit upon predictive models as one way to speed up this process (Kohler 1988:34). Another reason is that such models can assist in the management of cultural resources, especially when a large region is involved (DeBloois 1985:9). Whether or not this development has been beneficial to archaeology and cultural resources management, predictive models are now widely in use (Berry 1984; Kincaid 1988; Klesert 1987; Tainter 1984).

In its simplest form, a predictive model can be said to "identify patterns in spatial relationships between sites and their physical locations and thus indicate potential relationships between the natural or social environments and the locations of past human activities" (Kincaid 1988:550). While several different types of predictive model have been developed, almost all models focus on economics as the predominate factor in determining where sites are located. These models may use many different variables, but they tend to center around the fact that most humans will attempt to minimize the effort involved in obtaining those goods needed to survive (Kohler and Parker 1986:401).

Despite the wide variety of models which have been developed, all models fall under two basic categories. One type of model, an analytic/descriptive/correlative model, begins with the archaeological data generated by surveys (the analytic context) and attempts to determine how people used the world around them (the systemic context), thus predicting the location of sites discovered in the future. The other type of model, a systemic/behavioral/explanatory model, begins with a theory describing how people interact with their environment (systemic context) and predicts where sites should be located (analytic context) (Kohler 1988:37).

Analytic models are by far the most common type of model and this is the kind of model to be developed in this study. Systemic models are not nearly as common, and there are several reasons for this. Such models are very hard to develop, and are even harder to test (Sebastian and Judge 1988:8). Developing these models requires a great deal of detailed information on behavior and environment which is often hard to obtain. These factors lead to the fact that federal agencies rarely will fund the development of such models (Hay et al. 1982:14). Systemic models, such as optimal foraging theory, can be quite powerful (Kohler 1988:46-47), but serious questions have been raised as to whether such models can actually be tested using the archaeological record (Thomas 1986:251-261).

Analytic predictive models are by far the most common type of predictive model in use today. These models try to identify "relationships between archaeological site locations and environmental variables" (Sebastian and Judge 1988:4). Several different approaches have been taken to developing analytic predictive models, and many of these are described and evaluated in Cordell and Green (1984), Darsie and Keyser (1985), Klesert (1987), Kohler and Parker (1986), and Judge and Sebastian (1988). Analytic models can generally be assigned to three basic categories: associational, areal, and point specific (Altschul 1988). Associational models involve attempting to recognize simple patterns, such as whether sites tend to be found associated with certain variables. Areal models attempt to predict site frequency or density for a given land unit, for example, the number of sites likely to occur for a given quarter section. Point-specific models attempt to predict whether or not a particular spot is likely to contain a site.

All of the above approaches can involve the use of statistical analysis. While the statistical models tend to be more accurate, the use of increasingly sophisticated statistics does not necessarily lead to a corresponding increase in the accuracy of predictive models. Simple, non-statistical analytic models often can be as accurate and much easier to construct (Altschul 1988:65-68, 75-76). In this study it was decided to develop a non-statistical associational model. This model was developed using the same variables included in the settlement pattern study.

Before presenting the predictions for archaeological site locations developed from the settlement pattern study, several comments on the nature of predictive models are in order. These cautions are drawn from Altschul (1988:66-67), Brose (1984), Hay et al. (1983:13-14), and Kohler and Parker (1986:400-401). A major problem with using environmental variables to predict site location is that the modern environment and distribution of ecozones may be quite different from those in the past. This can greatly affect the accuracy of a model. This type of model works best with hunting and gathering societies, as the more complex a society, the less impact the environment has on site location due to such factors as political organization and markets. The interactions between the different variables are hard to determine in analytic predictive models. A model can not predict the locations of sites which are anomalous or those sites which are not represented in the data base used to develop the model. If the sample is skewed, the results will also be skewed. Even in hunting and gathering societies, factors other than economics are important for determining site locations, and these factors can not be incorporated in the model. A final problem with analytic models is that even if a model works perfectly, it does not necessarily tell us why the people used those locations. As Klesert (1987:233) has noted, "the use of predictive models has basic limitations: models are nothing more nor less than simplified abstractions of a variable and complex reality".

PREDICTIONS FOR SITE LOCATIONS ON THE ASHLAND DISTRICT

Based on the locations of previously recorded sites on the Ashland District (see Chapter 5), predictions can be made regarding where sites are likely to be found in the future. Each of the variables used to determine site location patterns will be evaluated as to its usefulness for predicting site locations. Predictions will then be made as to where sites may be found in the future.

Slope

From the results of this study, it is apparent that slope should be a good negative indicator of site location. Sites rarely occur on slopes of greater than 30%. In future surveys, sites should not be found on slopes of greater than 30% and sites should be more likely to occur on slopes of less than 30%.

Aspect

For some of the chronological time periods, one aspect is favored over another. When all sites are considered, however, no one aspect can be considered to be a good predictor for site locations. The variable of aspect is not likely to be a good predictor of site location.

Setting

A majority of the sites on the District are located on terraces and ridges. Sites are not located on butte tops nearly as frequently as they are on terraces and ridges; however, buttes are not as common a topographical feature as are terraces and ridges. Many of the buttes on the District contain sites, especially Late Prehistoric Period sites. Saddles are an isolated feature located on ridges. Sites only infrequently occur in the upland areas. From these distributions, it can be predicted that sites will be found on ridges, terraces, and buttes, and that few sites will be found in the upland prairies.

Ecozone

Sites occur in all ecozones, but some ecozones are more heavily utilized than others. Both positive and negative predictions can be made for these distributions. Sites will most frequently be found in the Creek Terrace ecozone and the Open Hillside ecozone. Some sites will be found in the Scoria-Sandstone Outcrop, Dry Slope Ponderosa Pine, and Upland Prairie-Grassland ecozones. Far fewer sites will be found in the Creek Bottom, Grassland Park, Moist Slope Ponderosa Pine, Upland Prairie-Sagebrush, and Upland Prairie-Bunchgrass ecozones.

The amount of land on the District included within each of these ecozones is known, as is the amount of land in the study area. It is possible to use these figures to attempt to predict the number of sites which should be found in each ecozone. This can be done by dividing the percentage of the total number of sites by the percentage of the land on the District found within a given ecozone and then multiplying the resulting figure by the percentage of the total area of the project area included within each ecozone. For example, 20.0% of the sites are found in the Creek Terrace ecozone, which includes 14.9% of the land on the District. Dividing 20.0% by 14.9% and multiplying that by 6.1% (the amount of land in the Schiller Fire survey area in the Creek Terrace ecozone), the resulting figure (8.2) is the number of sites which would be expected to be found in the that ecozone in the project area. These projected numbers are presented in Table 20 along with the number of sites actually found.

Distance to water

Proximity to current water sources does not appear to be an important factor for determining site locations. For this reason, the distance from the nearest water source is not a useful variable for determining site locations.

Soil types

Soil type should be a good predictor of site location. Fully 70% of the sites are found on only five different soil types, and the addition of seven more soil types accounts for over 90% of all recorded sites. Predictions for the potential locations of sites can be made based on this fact. The five primary soil types (mapping units Ca, Fm, Mg, Mw, Rt) should be considered to be high probability areas. It can be expected that a few sites will be found on the other seven soil types (mapping units Ec, El, Fk, Fl, Mt, Rs, Ru), but these do not carry as high a probability as the other five types. The remaining soil types should not contain any sites.

As with ecozone type, it is possible to predict how many sites should be found located on a given soil type. The same method which was described for estimating the number of sites in an ecozone will be used for soils.

Elevation

Sites on the Ashland District are found at all elevations. There is a greater number of sites in the middle elevations, however, this is not a distinct enough trend to be useful for predicting site locations. While there may be some temporal differences, these are not useful for predicting site locations. Elevation does not appear to be a good predictor for site locations.

TESTING THE MODEL

Developing a predictive model involves more than just making predictions as to where sites should or should not be located. A model can not be considered a valid or useful tool until it has been tested. Until it has been tested, a model has not been fully developed (Altschul 1988:87). In the previous section several predictions were made regarding the likely areas for sites to be present or absent. The accuracy of this model will be evaluated in this section. In order to properly test a model, it is necessary to have a sample large enough to obtain a good representation of the variables used in the model. Plog (1984:45) suggests that a survey of 1,000 acres is the minimum size which should be used for testing a model. Kincaid (1988:551), on the other hand, argues that a survey area of 5,000 to 10,000 acres is necessary. He also recommends a minimum of 30 sites be used to test the model (Kincaid 1988:552).

The model developed in this study will be evaluated using the results of a survey conducted on the Ashland District in late 1988 and 1989 (Wettstaed 1990). This survey covered 6,065 acres and located 118 prehistoric sites. One of these sites is a multicomponent site, resulting in a total of 119 components being used in the following discussions. The sites used to test the model were not part of the data base used to develop the model. In the following sections the Schiller Fire Archaeology Project will briefly be described and then the results of the survey will be presented in the same manner as those of the settlement pattern study presented above. These results will then be compared to the predictions made by the model developed in the previous section. Following this comparison, the accuracy and utility of the model will then be assessed.

The Schiller Fire Archaeology Project

During July, 1988 a large forest fire, the Schiller Fire, burned a total of 16,133 acres in the northern part of the District (Figure 6) (Wettstaed 1988, in press). Timber which has been killed by fire is very susceptible to infestation by insects, which threatens the

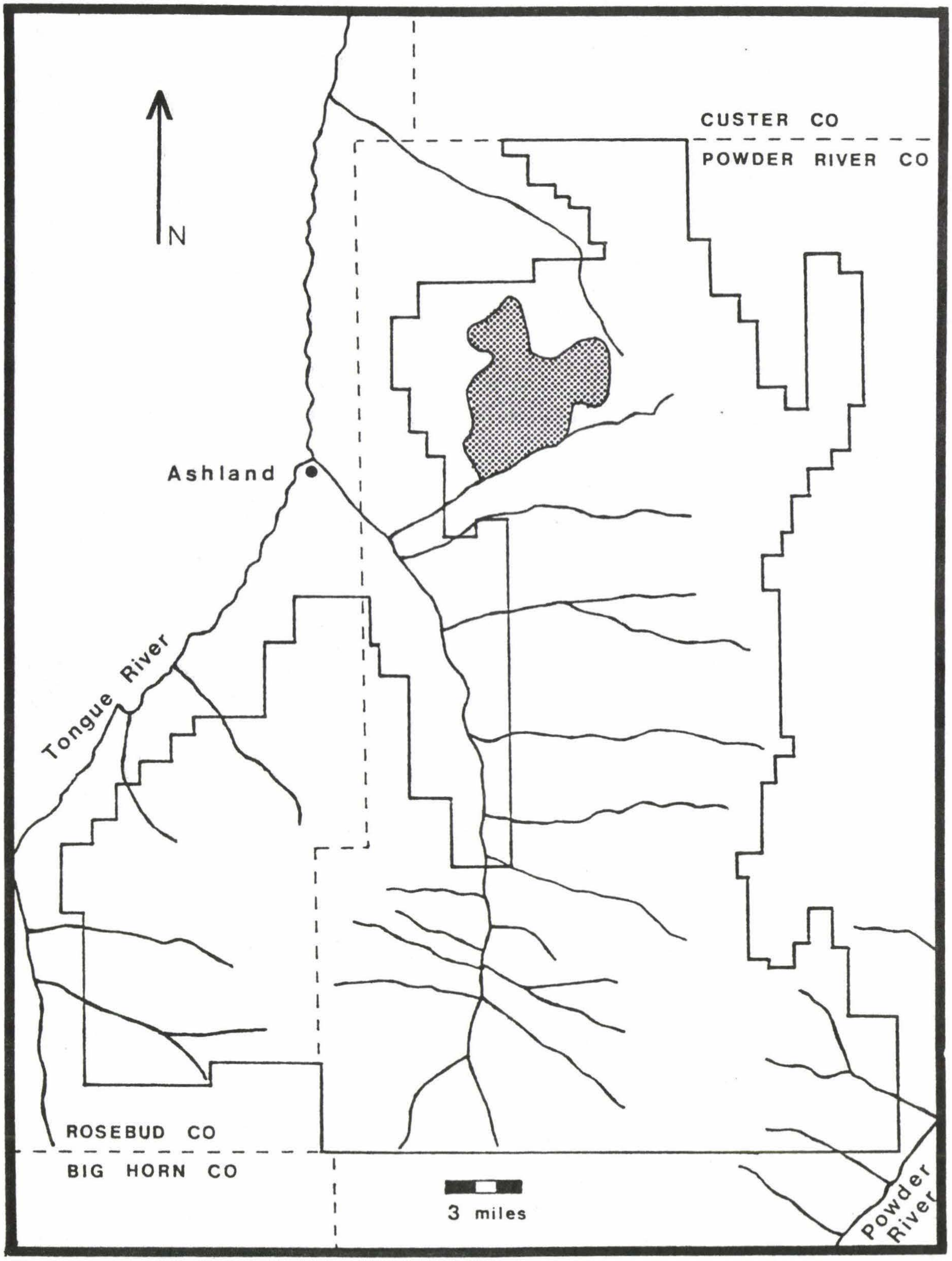

N
CUSTER CO
POWDER RIVER CO
Ashland
Tongue River
ROSEBUD CO
BIG HORN CO
3 miles
Powder River

FIGURE 6
Location of the Schiller Fire.

survival of the surrounding unburned timber. In order to mitigate the threatened infestation, the Forest Service decided to conduct a salvage logging operation in order to harvest much of the burned timber (Wettstaed 1990).

The Schiller Fire was located in the northern part of the District and was centered on Beaver Creek Divide, between Beaver Creek and the East Fork of Otter Creek (Figure 2). Steep, heavily forested ridges are characteristic of this part of the District, and wide, flat to gently rolling stream valleys are located to the north and south of the Divide. Beaver Creek Divide itself is a high, wide ridge which runs in an east-west direction, with narrow side ridges extending to the north and south. While the top of the divide is relatively flat, the sides drop off quite steeply to the stream valleys.

Before this salvage operation could begin, all proposed salvage units had to inventoried for the presence of cultural resources. Surveys covering 6,065 acres within and around the sale area were carried out in the fall of 1988 and the spring and summer of 1989. These surveys located a total of 121 components - 119 prehistoric and three historic. This is the highest site density known on the District (Wettstaed 1990).

One important result of this survey is the recording of an unusually high site density - one site every 51 acres. The site density for the rest of the District is an average of one site every 66 acres. Only one other survey conducted on the Ashland District has recorded such a high site density. This was the Michal Land Exchange (Wettstaed and Hill n.d.), which has a density of one site every 31 acres. The site density for the rest of the Pine Parklands is even less than on the rest of the Ashland District. Using data presented by L. Fredlund (1987: Table 10.2), it can be determined that a site density of one site every 79 acres exists in the areas covered by the surveys summarized in her report. This figure includes both sites and MALs (see Chapter 4 for a discussion of MALs and sites). If MALs are not included in this total, the density is one site for every 239 acres. The survey for the Montco Mine (Waldman 1979), located just west of the Ashland District (Figure 4), did record a site density (one site every 53 acres) comparable to that of the Schiller Survey (this total also comes from combining MALs and sites, if just sites are used, the density is one site every 341 acres).

Deaver and Deaver (1988:123-125) have suggested that a more accurate way to compare survey results is to compare site coverage, which is the percentage of the survey area which is actually covered by sites. The average coverage for southeastern Montana is 1.4%. For the Schiller Fire survey area, the coverage is 3.5%. This is a substantially higher percentage of site coverage than for the rest of southeastern Montana and provides additional support for the idea that the results of the Schiller Fire surveys are unusual when compared to the surrounding region.

Two possible explanations can account for this high site density (Wettstaed 1990). One explanation is that the Schiller Fire project area is unique in some manner which attracted an unusually high frequency of utilization. High quality porcellanite outcrops are very common in the project area and this may be a factor. The Michal Land Exchange survey area also contains high quality porcellanite outcrops, and it is located near what was a common travel route for Native

Americans in the late 19th century (Hill personal communication 1989). While most documented trails in the Northwestern Plains follow stream bottoms, it is likely that they crossed the uplands between the major rivers (Malouf 1981). It is possible that a trail crossed the top of Beaver Creek Divide, as a high site density is usually associated with a trail (Blakeslee and Blasing 1988; Blasing 1986).

An alternative explanation for the high site density is that the improved visibility caused by the fire resulted in an increase in the number of recorded sites (Wettstaed 1990). During the survey, visibility was close to 100% in many areas because the fire had removed the grass and pine duff which normally obscures the ground. In a wet year grass can grow to be waist high and pine duff always covers the ground in forested areas. There is a distinct possibility that small, unobtrusive sites have been under reported by past surveys in the area as a result of poor visibility.

Two factors which can influence whether or not a site is located by a survey are obtrusiveness and visibility (Schiffer et al. 1978:6; Schiffer and Wells 1982:347-349). A large site with dozens or hundreds of artifacts is more likely to be found than a small site with a few artifacts. Visibility can also have a significant effect on whether or not a site is located. The ability to locate and record sites (or the lack thereof) is always a problem in archaeology. Concealment of sites by heavy vegetation can be a problem, and many sites located in such areas can potentially be missed by surveys. The improved visibility caused by the fire may have resulted in a higher number of sites being recorded than usual. It should be noted that models based on surveys which do not locate all of the sites in an area will therefore not be 100% accurate (Pettigrew 1985).

The sites located by this survey provide an excellent cross section of the types of sites located on the District. Site types range from large base camps with thousands of artifacts to small lookout sites with a handful of artifacts. Few sites (7 sites or 6.4%) contain non-local raw material. Three of the five chronological time periods in use in the region (Middle Archaic, Late Archaic, Late Prehistoric) are represented by these sites (Wettstaed 1990). Significant discoveries made by this survey include the location of only the third Yonkee Complex site recorded on the District, in addition to the recording of three new Besant Complex sites. The size of the area covered (6,065 acres) and the number of prehistoric components located (119) should provide an excellent sample to evaluate the proposed predictive model.

Survey Results

The following section briefly presents the results of the survey as they pertain to the variables used in the predictive model. These results are presented in Tables 9 through 16, and only brief summaries of each of the variables will be presented.

Slope

As was noted in the settlement pattern study presented above, slope (Table 14) appears to be an important factor for site location. Fully 91% of the sites in the sample are located on slopes of less than

TABLE 14. Schiller Fire Site Location by Slope

Percent Slope	# of Sites	% of Sites	% for District
> 50	1	0.8	0.8
> 40	3	2.5	3.7
> 35	10	8.4	7.0
> 30	19	16.0	9.9
> 25	30	25.2	15.5
< 25	89	74.8	84.5

TABLE 15. Schiller Fire Site Location by Aspect

Aspect	# of Sites	% of Sites	% for District
North	2	1.7	9.9
Northwest	5	4.2	2.5
Northeast	5	4.2	8.5
West	9	7.6	13.0
East	5	4.2	10.1
South	7	5.9	17.6
Southwest	12	10.1	5.0
Southeast	7	5.9	3.9
Open	67	56.3	29.6

TABLE 16. Schiller Fire Site Location by Topographic Setting

Landform Setting	# of Sites	% of Sites	% for District
Butte	0	0.0	7.2
Saddle	5	4.2	7.2
Ridge	101	84.9	36.2
Terrace	13	10.9	43.2

35%. A surprisingly high number of sites are, however, located on the steeper slopes. A total of 16% of the sites are found on slopes greater than 30%, and 25% of the sites occur on slopes of more than 25%.

Aspect

Sites located in the area covered by this survey face in all directions (Table 15). There is, however, a very strong predominance of sites with an open aspect. Over half (56.3%) of the sites are located in settings with no predominant aspect. Following an open aspect, the next most common directions are a generalized southern aspect (21.9%) and a western aspect (21.9%). Both northern and eastern aspects do not appear to be favored to any extent.

Setting

Only three site settings (Table 16) were recorded for sites located by this survey. The most common setting is a ridge top setting, with 84.9% of the recorded sites being located on ridges. Stream terraces are the next most common (10.9%), followed by saddles (4.2%). It should be noted that upland prairies are not present in this part of the District, and that isolated buttes do not occur with much frequency. Thus, these landform settings should not be considered as possible site locations in the study area.

Distance to Water

Proximity to water (Table 17) does not appear to be an important factor for site location within the study area. Only 29% of the sites

TABLE 17. Schiller Fire Site Location by Distance to Water

Distance to Water	# of Sites	% of Sites	% for District
≤ 500 feet	8	6.7	21.7
≤ 1000 & > 500	12	10.1	11.8
≤ 1500 & > 1000	12	10.1	10.1
≤ 2000 & > 1500	12	10.1	6.2
≤ 2500 & > 2000	8	6.7	4.1
≤ 3000 & > 2500	10	8.4	4.6
≤ 3500 & > 3000	6	5.0	5.0
≤ 4000 & > 3500	15	12.6	3.3
≤ 4500 & > 4000	5	4.2	6.2
≤ 5000 & > 4500	7	5.9	4.1
≤ 5500 & > 5000	10	8.4	3.7
≥ 5500	14	11.8	19.2

TABLE 18. Schiller Fire Site Location by Soil Type

Soil Type*	% of land	# of Sites	# expected	% of Sites
Ca	47.3	47	91.2	39.5
Rt	22.3	32	158.4	26.9
Fm	10.1	19	83.2	16.0
Mw	5.1	8	6.9	6.7
Fk	5.1	5	26.5	4.2
Fh	0.5	3	-~	2.5
Ro	2.2	3	-	2.5
Fl	0.6	1	3.4	0.8
Rf	1.2	1	-	0.8

* see text for descriptions of soil types

~ No predictions made as this soil type accounted for so few sites.

located by the survey are found within 1,500 feet of water. In fact, it appears that sites may have been purposely located away from water, with 59% of the sites being located between 1,500 and 5,500 feet from water and 11.8% being located beyond 5,500 feet from water.

Soils

Sites located by the Schiller Fire survey appear to be closely associated with certain soil types (Table 18). Three soil types (Ca, Rt, and Fm) account for 82.4% of the sites located in the survey area. The addition of two more soil types (Mw, Fk) bring this total up to 92.3%. It should be noted that these soil types account for 89.9% of the land in the survey area. There is a rough correlation between the percentage of land involved and that percentage of sites found on that land. Sites may be most frequently found on these soil types because they are the most common soil types.

Elevation

There appears to be a definite correlation between elevation (Table 19) and the presence of sites. Site frequency steadily decreases with a decrease in elevation. A total of 72.3% of the sites in the study area are located above 3,700 feet elevation, and only 3.4% are located below 3400 feet elevation. It should be noted that the survey area is located in an area with higher elevations than the surrounding areas. The primary topographic feature of the northern one half of the District is Beaver Creek Divide, and the survey area is centered on this feature.

TABLE 19. Schiller Fire Site Location by Elevation

Elevation	# of Sites	% of Sites
≥ 4000	43	36.1
< 4000 & ≥ 3700	43	36.1
< 3700 & ≥ 3400	29	24.4
< 3400 & ≥ 3000	4	3.4
< 3000	0	0.0

TABLE 20. Schiller Fire Site Location by Ecozone.

Ecozone	% of land	# of Sites	% of Sites	% for District
1. Creek Bottom	?	0	0.0	0.0
2. Creek Terrace	5.7	4	3.4	20.0
3. Open Hillsides	29.6	31	26.1	25.8
4. Scoria Outcrop	3.3	9	7.6	12.4
5. Grassland Parks	5.0	12	10.1	6.4
6. Dry Slope Pine	50.9	62	52.1	17.4
7. Moist Slope Pine	5.4	1	0.8	2.1

TABLE 21. Chronological Placement of Schiller Fire Sites

Chronological Period	# of Sites	% of Dated Sites	% for District
Paleoindian	0	0.0	2.7
Early Archaic	0	0.0	0.6
Middle Archaic	1	11.9	12.0
Late Archaic	5	55.6	35.9
Late Prehistoric	3	33.3	35.2

Ecozone

Sites located by this survey are situated in six of the 10 defined ecozones (Table 20). Three of the ecozones, the Upland Prairies, are not found in the study area and no sites were found in the Creek Bottom ecozone. The Dry Slope Pine ecozone accounts for over 50% of the sites located in the study area. Next most common is the Open Hillside ecozone (26.1%) and the Grassland Parks ecozone (10.1%). The remaining three ecozones (Creek Terrace, Scoria Outcrop, and Moist Slope Pine) together account for less than 12% of the sites.

Chronology

As was mentioned above, three time periods are represented by the sites discovered by this survey (Table 21). Only eight of the 118 sites contained diagnostic material, however one site contained two components. One site is dated to the Middle Archaic Period, and three to the Late Prehistoric Period. The remaining five sites are Late Archaic in age, with one each representing the Yonkee and Pelican Lake Complexes, and three belonging to the Besant Complex. With such a small sample, it is not possible to make generalizations about land use in relation to time period.

COMPARISON BETWEEN MODEL AND SCHILLER FIRE SURVEY RESULTS

The results of the survey conducted for the Schiller Fire salvage timber sales can be used to test the predictive model developed in the previous chapter. A comparison between the results of this survey and the predictions for site location show that while some parts of the model are accurate, other parts need to be revised. The following is a comparison between the expected results and the actual results of the survey. This comparison is presented by variable.

Slope

The model predicts that sites should not be found on a slope of greater than 30%. However, 16.0% of the sites located by the survey are located on slopes of greater than 30%, as compared to 9.9% of the total sites on the District. It should be noted that 12 of the 19 sites (63.2%) located on slopes of greater than 30% are lithic procurement sites. This is a type of site which is oriented to a specialized activity. Porcellanite outcrops are more common in the northern part of the District (where the survey area is located) and most are located on steep slopes. The other seven sites are activity areas (primary or secondary reduction sites), and the site report for each site indicates that the spot where each site is located is relatively flat. For example, the top of a sandstone outcrop or a flat bench high up on a slope.

Two possible explanations in addition to the high frequency of porcellanite outcrops can account for the large number of sites located on steep slopes. One explanation is that sites located on steep slopes have been under reported as a result of surveyors avoiding such areas because of a perceived low probability for a site being present. If steep slopes are only infrequently examined, then sites will only be infrequently recorded in such locations. An alternative explanation for a higher number of recorded sites on steep slopes is the increased visibility as a result of the fire. These sites are primarily small in size with only a few artifacts. Low visibility under normal survey conditions could have resulted in a lower number of such sites being recorded by past surveys.

As a result of this comparison, it is apparent that the slope part of the predictive model needs to be adjusted. This can be done in two ways. One way would be to state that sites should not be found in locations with a slope of greater than 30% unless a porcellanite outcrop is present. The presence of a porcellanite outcrop would greatly increase the likelihood for the presence of a site. A problem with this approach is that porcellanite outcrops are not indicated on the topographic maps which would be used to predict site locations in the future. An alternative would be to change the percent of slope used to predict site locations from 30% to 35%. Only 9.0% of the sites located by the Schiller Fire survey are found on slopes of greater than 35%, and only 7.0% of the previously recorded sites on the District. A problem with this approach is that a disproportionate number of lithic procurement sites, compared to camp sites, could be excluded using this approach. The overall number of sites missed would, however, be quite small. It is therefore recommended that the model be adjusted in regards to slope so that sites are predicted to not be located on slopes of greater than 35%.

Setting

The model predicted that sites should be found primarily on ridges and terraces. This is supported by the results of the Schiller Fire survey. A discrepancy exists, however, in the fact that ridges are utilized to such a high extent in comparison to stream terraces. On the District as a whole, terraces account for a greater percentage of the sites than do ridges. This difference can be explained by the fact that the area of the survey is quite rugged and wide stream terraces are not common. As was noted previously in the discussion of elevation, the survey area is centered on Beaver Creek Divide. This is a high, wide ridge system which runs in an east-west direction and is the primary topographical feature in the northern part of the District. The section of the predictive model concerning landform setting is not invalidated by the results of the Schiller Fire survey. Archaeological sites are predicted by the model to occur overwhelmingly on ridges and terraces, and this is exactly what is seen in the results of the survey. When wide stream terraces are present in the project area, sites do occur on these terraces.

Soil types

The model predicts that archaeological sites will be found almost exclusively on five soil types. These soil types are Ca, Mw, Rt, Fm, and Mg (see Chapter 5 for a description of these soil units). In the survey area, 89.1% of the sites are found on four soil types - Ca, Rt, Fm, and Mw. Seven additional soil types are listed in the model as possibly containing sites, but with a very low frequency. A total of 5.0% of the sites located by the survey occur on soils in this category. Only 5.9% of the sites recorded by this survey are located on soils which are predicted to not contain sites. This agrees with the predictions and this part of the model is accurate.

As was mentioned above, the percentage of the project area included within each soil type is somewhat similar to the percentage of sites found on each of these soil types. This correlation is not found on the District as a whole, so further research is needed to determine if there is a relationship between soil type and site locations beyond the fact that sites are found on the most common soil types. It should be noted that the figures for percent of land encompassed by each soil type are for all of Powder River County, as well as that part of Rosebud County which contains the Ashland District. Figures for just the Ashland District itself are not available.

It can be seen from Table 18 that the number of sites predicted to be found on each soil type do not agree with the number actually recorded. A substantially smaller number of sites were found than were predicted. This suggests that this type of approach will not work for soil types.

Ecozone

As with the soil types, ecozones where divided into those which should contain most of the sites, those which may contain a few sites, and those which should not contain sites. High probability ecozones are considered to be the Creek Terrace and Open Hillside ecozones. A total of 29.4% of the sites in the survey area are located in these ecozones, a much lower percentage than would be expected from the model. On the District as a whole, 47.2% of the sites occur in these ecozones. The model predicted that sites would rarely be found in the Creek Bottom, Grassland Park, Moist Slope Pine, and Upland Prairie-Sagebrush/Bunchgrass ecozones. In the survey area, 10.9% of the sites occur in the second and third ecozones listed here, while the Upland Prairie ecozones do not occur in the survey area. No sites were found in the Creek Bottom ecozone. The remaining 59.7% of the sites occur in the Scoria-Sandstone and Dry Slope Ponderosa Pine ecozones, which should have contained only about 39%.

The most noticeable discrepancy between the model and the results of this survey are the high number of sites in the Dry Slope Pine ecozone. On the rest of the District, 17% of the sites occur in this ecozone while 52% of the sites recorded in the project area are located in the Dry Slope Pine ecozone. A possible reason for this significant difference is the improved visibility due to the fire (Wettstaed 1990). The ground surface in the Dry Slope Pine ecozone is usually obscured by pine duff and grass, but this was removed by the fire. Improved visibility may have lead to the recording of more sites than would occur under normal survey conditions. If the percentage of sites (17%) recorded elsewhere on the District in the Dry Slope Pine ecozone had been recorded by the Schiller Fire Survey, then only 19 sites, rather than 62, would have been located. The resulting site density would then be one site every 63 acres. This is very close to the density of one site every 66 acres elsewhere on the District (Wettstaed 1990).

From this comparison, it can be seen that the ecozone part of the model needs to be revised. Fewer sites than would be expected occur in the ecozones predicted to contain sites, while more sites than expected occurred in those predicted to not contain sites. One factor which needs to be considered is that these predictions were made in part based on a comparison between the number of sites in a ecozone and the frequency of that ecozone on the District. If, for instance, 20% of the sites were located in an ecozone which accounted for only 10% of the land on the District, that ecozone was considered to be a high probability ecozone. This method does not appear to have worked for predicting site locations, as a substantial number of sites would have been misclassified using this approach. All ecozones contain sites and it does not appear to be possible to write off any given ecozone and state that sites will not be found in that ecozone.

An examination of Table 20 also reveals that the number of sites predicted to be found in each ecozone are different from the number actually found. Overall, a higher number of sites were found, but in some ecozones fewer sites than predicted were found. As with soil types, this method does not appear to work.

DOES THE MODEL WORK?

Parts of the model as originally designed are fairly accurate. A comparison of each of the variables used in the model reveals that 16% of the sites would have been missed using slope as a predictor, none would have been missed using landform, 12.7% would have been missed using the five primary soil types and only 8.2% if the other seven soil types were taken into consideration. Ecozone, however, does not appear to be a good predictor of site location. Only 28.8% of the sites occur in high probability areas, compared to 19.9% in low probability areas and fully 56.5% in the areas of moderate probability.

After making these comparisons it is suggested that ecozone not be used as a primary factor in a predictive model. Future use of this model should rely primarily on the variables of slope and soil type. Ecozone can be used to supplement the other two variables. The ecozones which can be considered to be high probability are Creek Terrace, Open Hillsides, and Dry Slope Pine. Scoria Outcrops and Grassland Parks can be considered medium probability areas, while Creek Bottom, Moist Slope Pine, and Upland Grasslands can be considered low probability. It is expected that a majority of sites will be found on slopes of less than 35%. The soil types can be broken down into the same three categories originally proposed - high probability, low to moderate probability, and those soils which should not contain sites. These predictions are always subject to further revisions as additional data is obtained by future surveys. Landform is of limited use, as only upland prairies appear to lack sites and this was not tested by the present study because this landform was not present in the study area.

It is possible that the percentage of sites found on a given soil type is simply related to the frequency of that soil type on the District. This appears to be the case with the Schiller Fire Project area, but not on the rest of the District. Further tests of this model need to be made in order to determine the exact relationship between soil type and site location.

One aspect of this study which should be noted is that the part of the District in which the model was tested appears to be unusual. There is a very high site density which may be associated with the high frequency of porcellanite outcrops and/or the presence of a trail. Increased visibility caused by the Schiller Fire may also have contributed to the high site density, and the excellent visibility is unusual for the District as a whole. If this area is as unusual as it appears, then this may not have been the ideal place to test the model.

One potential problem with using this predictive model on the Ashland Ranger District is the nature of the areas predicted to contain/not contain sites. On the Ashland District, these are small localized areas, sometimes only a few acres in size, resulting in a mosaic pattern (see Figure 5). This contrasts with an area such as the Southwestern United States, where large blocks of land, sometimes hundreds of acres, can be designated low probability areas (Cordell and Green 1984). A pattern such as that found on the Ashland District reduces the usefulness of the predictive model as a management tool.

CHAPTER 7

LAND USE PATTERNS ON THE ASHLAND RANGER DISTRICT

Over the past 11,000 years many different groups of people have lived in and used the resources of the Ashland Ranger District. While all of these groups have been hunters and gatherers, they have exploited this area in many different ways. A number of these differences reflect variations in the cultural beliefs and practices of these people. Some of these differences may result from changes in the environment. Unfortunately, however, no good paleoenvironmental data exists for the Pine Parklands region, so any discussion of changes in land use resulting from changes in the environment would be pure conjecture.

Several variables which have the potential to affect site locations were examined in this study. Almost all variables appear to differ in importance depending on the time period or even between different groups using the area at the same time. As a result of this fact, it is not useful to describe overall patterns without reference to time. As will be seen in the following discussion, there are further problems with generalizing about site distributions for a given period of time when several groups may have been using the area in different ways.

About the only variables which do not differ to any real extent by time period are slope and soil types. Most sites (90.6%) are located on slopes of less than 30%, with the only sites located on steeper slopes being task-specific special activity sites, such as lithic procurement at porcellanite outcrops or rock art. There is no consistent pattern of preference for soil types beyond the fact that the soil mapping units which contain a majority of the sites on the Ashland District are loams. Sandy soils are not preferred, contrary to L. Fredlund (1981:127-129, 152-153).

The following discussion concerns changes in land use patterns on the Ashland Ranger District over time. This discussion focuses on those sites which have been assigned to a chronological period. Except for a very few sites, such as rock art, all sites on the District consist of surface scatters of lithic debris with few diagnostic artifacts. In many sites buried material is present which could date the site, but excavation is required to recover this material and very few sites have been excavated on the District. Since only 19% of the sites (101 sites) recorded on the Ashland District can be assigned to such periods, a large body of data is not being utilized. This is unavoidable because it is not possible at this time to determine when these sites were occupied. Since only 19% of the site data will be analyzed, there is a distinct possibility that the following hypotheses concerning land use patterns on the Ashland District may be inaccurate.

One potential problem encountered when dealing with the types of sites found on the Ashland District is that discard behavior and refuse storage vary between cultural systems, and this affects what is seen in the archaeological record (Binford 1977; 1979; Schiffer 1987:67, 89-95). If a group of people utilized a highly curated technology and left behind few diagnostic artifacts, this group could appear to have used the area much less frequently than another group which discarded a large number of diagnostic artifacts. A highly mobile group which did not stay in one place for any period of time would most likely appear to use the area less frequently than a group which only occasionally used the area, but stayed in one place for a long period of time when they did so.

Another factor which must be considered is the differential preservation of archaeological sites (Butzer 1982:45-46, 54). Sites situated next to springs are more likely to become deeply buried, and thus invisible, than are sites located on high, wide ridges. Small sites located on a slope or near the edge of a ridge are at higher risk of experiencing erosion than are other sites. Many different factors affect the survival of a site (Schiffer 1987), and it is not always possible to determine what events may have occurred in the past to alter the archaeological record.

One last factor which could effect the results of this study is a bias in the data used. One cause of such bias would be the fact that the sites used in this study are those recorded on public land. Most of the wide stream terraces are in private landholdings. Many sites have been recorded in these areas through the assistance of informants; but, it is likely that a bias still exists. The sample of data used in this study is much larger than that available to Beckes (1976; 1978) and McLean (1975) in their studies of the Ashland District (589 sites compared to 181). A larger sample size has resulted in changes in the interpretations of settlement patterns on the District from those made by Beckes and McLean. It is always possible that additional surveys will provide data which rejects the previous studies (Schiffer 1987:340-343). An example of this is in 1983 two Besant sites had been recorded on the Ashland District, while at the time of this study a

TABLE 22. Aspect by Time - Final Total.

Time	N	NE	NW	W	E	S	SE	SW	OPEN
P*	-	1	-	2	-	2	-	-	8
EA	-	1	-	-	-	1	-	1	-
MA	1	1	1	2	-	2	1	-	4
LA	2	2	1	2	4	8	3	4	12
P	-	1	-	-	-	1	-	1	4
Y	-	-	-	-	1	1	-	-	1
B	-	-	-	-	1	1	1	-	6
O	2	1	1	2	2	5	2	3	1
LP	-	5	-	3	4	4	2	1	16

TABLE 23. Topographic Setting by Time - Final Total.

Time	Upland	Saddle	Butte	Ridge	Terrace
P*	1	2	1	4	5
EA	1	-	-	-	2
MA	-	2	1	1	8
LA	1	1	2	12	22
P	-	-	1	2	4
Y	-	-	-	-	3
B	-	1	1	6	1
O	1	-	-	4	14
LP	4	-	7	14	10

* P = Paleoindian, EA = Early Archaic, MA = Middle Archaic, LA = Late Archaic, P = Pelican Lake, Y = Yonkee, B = Besant, O = One Bear, LP = Late Prehistoric

TABLE 24a. Distance to Water by Time - Final Total.

Time	≤500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000
P*	3	-	3	-	1	-
EA	2	-	-	-	-	-
MA	6	1	-	1	-	-
LA	13	7	2	1	-	2
P	2	2	-	-	-	-
Y	-	1	1	-	-	-
B	1	2	-	-	-	-
O	10	2	1	1	-	-
LP	3	2	7	3	2	1

TABLE 24b. Distance to Water by Time - Final Total.

Time	3000-3500	3500-4000	4000-4500	4500-5000	5000-5500	≥5500
P*	3	-	-	1	-	2
EA	-	-	-	-	-	-
MA	1	-	1	-	1	1
LA	-	-	2	3	1	7
P	-	-	1	-	-	2
Y	-	-	1	-	-	-
B	-	-	-	1	1	2
O	-	-	-	2	-	3
LP	4	1	3	1	1	7

* P = Paleoindian, EA = Early Archaic, MA = Middle Archaic,
LA = Late Archaic, P = Pelican Lake, Y = Yonkee, B = Besant,
O = One Bear, LP = Late Prehistoric

TABLE 25. Elevation by Time - final Total.

Time	<3000	3000-3400	3400-3700	3700-4000	≥4000
P*	-	2	5	5	1
EA	-	-	2	-	1
MA	-	-	6	3	2
LA	-	8	13	8	9
P	-	1	3	-	3
Y	-	1	-	-	2
B	-	-	5	2	2
O	-	6	5	6	2
LP	-	5	10	9	11

TABLE 26. Ecozone by Time - Final Total.

Time	2~	3	4	5	6	7	8, 9, 10	NA
P*	4	2	2	2	-	-	1	2
EA	-	1	-	-	-	-	1	1
MA	3	2	-	3	1	-	2	1
LA	11	8	3	1	8	-	6	1
P	1	1	-	-	3	-	1	1
Y	2	-	-	-	-	-	1	-
B	2	3	1	-	2	-	1	-
O	6	4	2	1	3	-	3	-
LP	7	9	5	3	5	-	5	1

* P = Paleoindian, EA = Early Archaic, MA = Middle Archaic, LA = Late Archaic, P = Pelican Lake, Y = Yonkee, B = Besant, O = One Bear, LP = Late Prehistoric

~ Numbers are those assigned to each ecozone in the text.

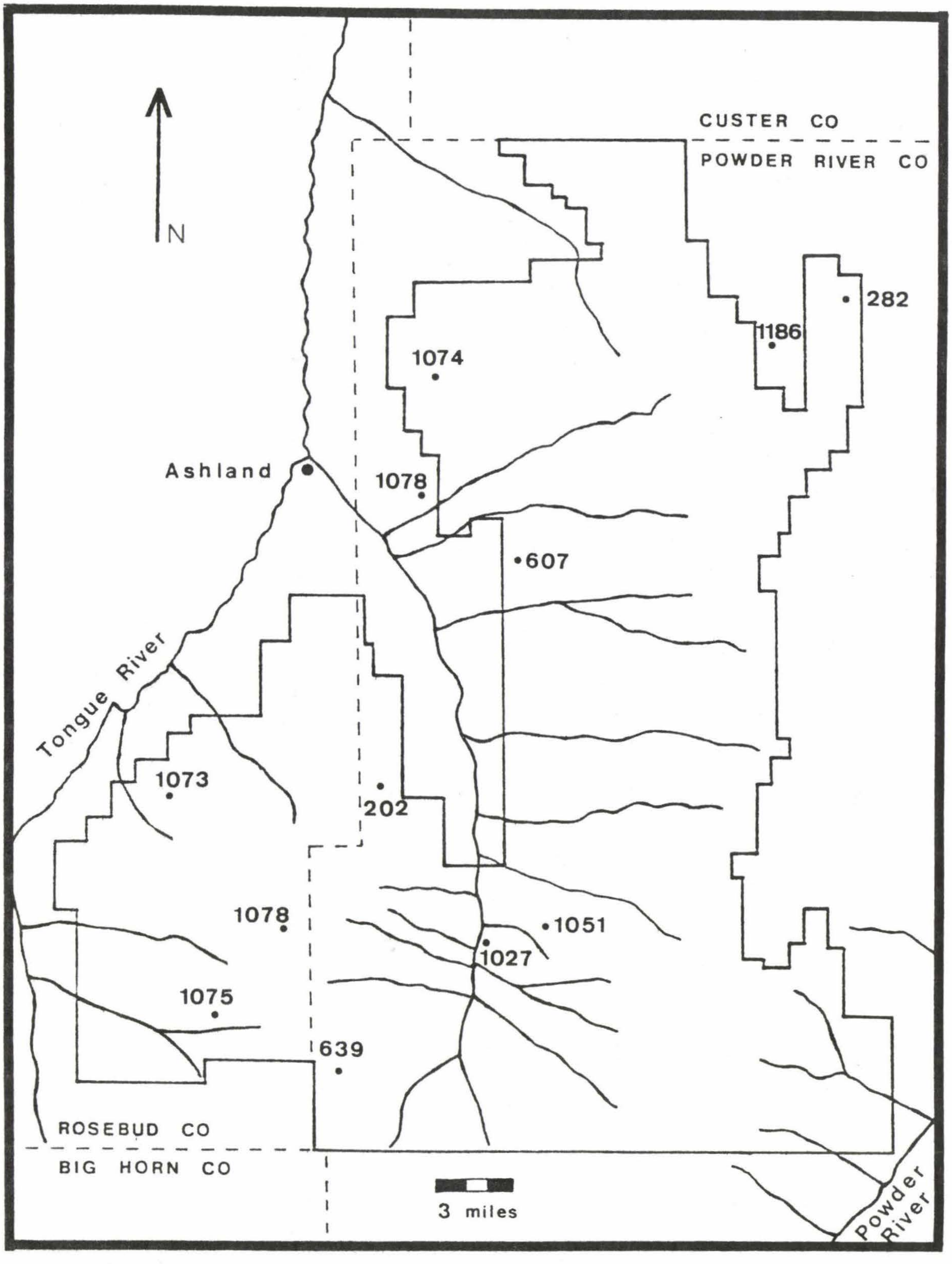
total of nine have been recorded. Three of these were recorded in the last year. With these cautions in mind, it is now possible to address land use patterns on the Ashland District. The data used in this discussion are presented in Tables 22 through 26.

PALEOINDIAN PERIOD - 11,500 to 7,500 B.P.

No Paleoindian Period sites were recorded by the Schiller Fire surveys, so no new data has been added to the existing information presented in the previous chapters. While a total of 13 Paleoindian sites (Figure 7) have been recorded on the District, these represent seven complexes covering a span of 3,000 years. Of these seven complexes, Agate Basin is the most heavily represented with a total of three sites. All clearly defined Paleoindian complexes following Agate Basin (Hell Gap - 2 sites, Alberta - 1 site, and Cody - 2 sites) are represented on the Ashland District. Three of the terminal Paleoindian complexes (Browns Valley, Jimmy Allen, and Angostura), which have not been clearly defined and are not well understood, are also present.

In general, Paleoindian sites are widely scattered throughout the ecozones of the Ashland District. While no sites have been found in the forested areas they occur with an equal frequency in the mesic and xeric grasslands. Paleoindian sites are found on all landforms and most frequently with an open aspect. Most of the Paleoindian sites are located more than 1,000 feet from a current water source and are found at all elevations.

There are problems, however, with making such generalizations about the Paleoindian Period. An obvious problem is that it is highly unlikely that the current ecozones and water sources are the same as



N
CUSTER CO
POWDER RIVER CO
282
1186
1074
Ashland
1078
607
Tongue River
1073
202
1078
1051
1027
1075
639
ROSEBUD CO
BIG HORN CO
3 miles
Powder River

FIGURE 7
Paleoindian Period Sites.
Sites in Powder River Co. are numbered 24PR---.
Sites in Rosebud Co. are numbered 24RB---.

those which existed at the time these sites were occupied. This is a problem with any study of this nature, however, it is much worse when dealing with a time frame which extends back over 10,000 years. Sites this old are also much more likely to have experienced differential preservation. Another problem is the large number of Paleoindian complexes represented on the Ashland District. Seven different complexes make up the Paleoindian record of the Ashland District, and these cover 3,000 years. Generalizations addressing a time frame this broad are likely to be inaccurate. At best one can note that the Paleoindian occupation of the Pine Parklands was infrequent, but did occur.

EARLY ARCHAIC PERIOD - 7,500 to 4,500 B.P.

A total of three Early Archaic sites (Figure 8) have been recorded on the Ashland District. All three have been categorized as the Oxbow Complex, based on the style of projectile points found at those sites. It was once thought that the Plains were abandoned during the Early Archaic because of the Altithermal Climatic episode (a period which was warmer and dryer than today). However, current consensus is that this is not the case. At worst, the inhabitants retreated to the more sheltered and cooler areas, such as the mountains, and used the open plains seasonally (Frison 1978:41-46). Reeves (1973) has suggested that the general lack of Early Archaic sites may be due to differential preservation of the sites.

While the Ashland District was not heavily utilized during the Early Archaic, people were present. There are more sites assigned to the Early Archaic Oxbow complex than to any Paleoindian complex except

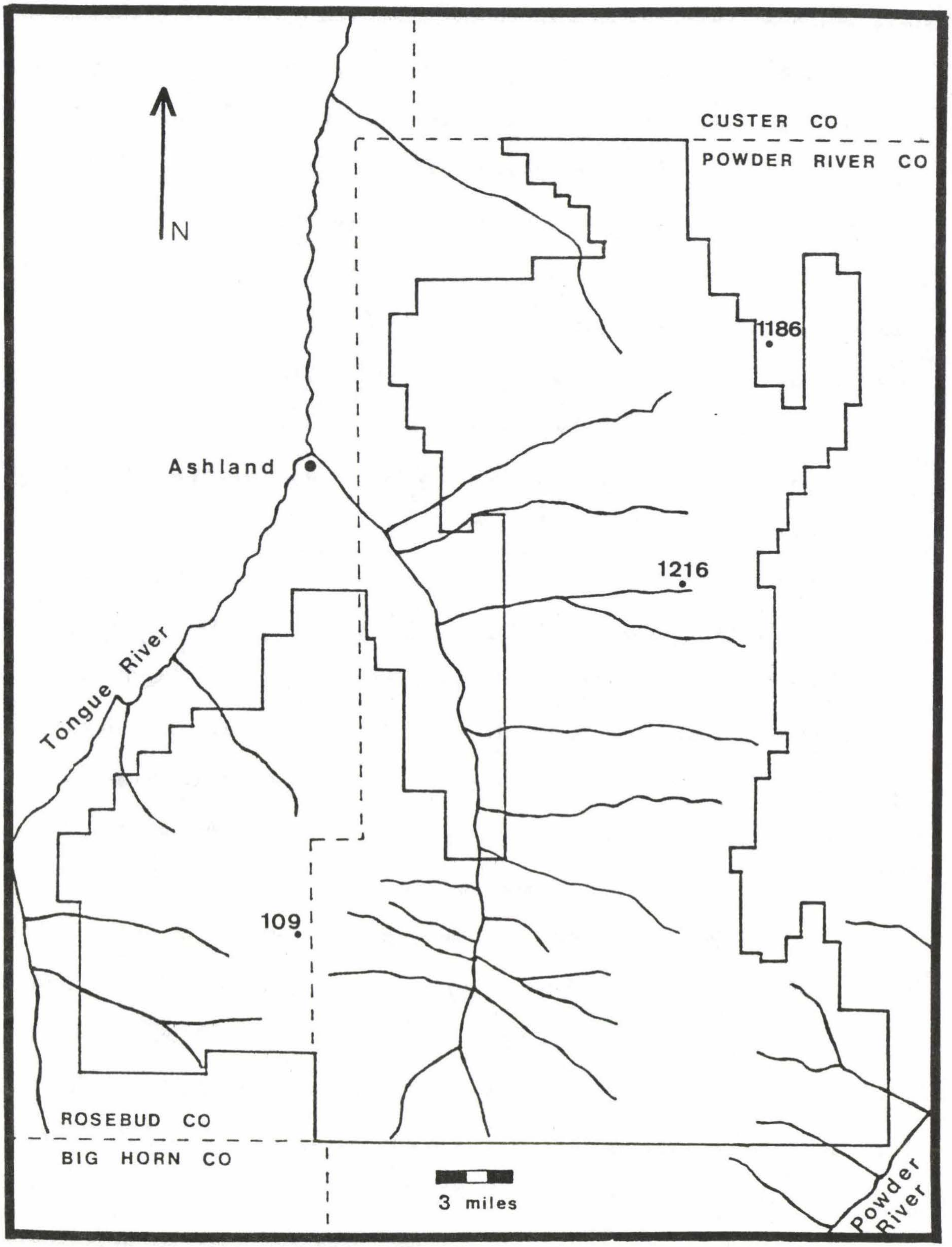

N
CUSTER CO
POWDER RIVER CO
1186
Ashland
1216
Tongue River
109
ROSEBUD CO
BIG HORN CO
3 miles
Powder River

FIGURE 8
Early Archaic Period Sites.
Sites in Powder River Co. are numbered 24PR---.
Sites in Rosebud Co. are numbered 24RB---.

for Agate Basin. Oxbow is, however, assigned a date which places it at the end of the Early Archaic Period. In some places (for example, the Black Hills) Oxbow is partially contemporaneous with the McKean complex (Beckes and Keyser 1983:97-98; Frison 1978:45-46; Sundstrom 1989:48-56). Determining the nature of the Early Archaic occupation of the Pine Parklands must await the addition of further data.

MIDDLE ARCHAIC PERIOD - 4,500 to 3,000 B.P.

The Middle Archaic Period is characterized by the McKean Complex, which includes several projectile point styles. Three styles, McKean lanceolate, Duncan, and Hanna, are represented on the Ashland District. The relationship between these different styles is not at all clear, and it is likely that the McKean Complex represents a number of different cultural groups (Sundstrom 1989:90-93). At the present time it is not possible to determine the difference between the various groups represented by the different point styles, so they are all considered together.

McKean adaptations have traditionally been examined in the context of an overall pattern for the entire Plains region. It now appears, however, that this is not a useful approach (Keyser and Davis 1984:56-60; 1985). These regional views have noted the variety of subsistence strategies employed by McKean groups, and this variety in subsistence bases has usually lead to the conclusion that McKean peoples utilized a generalized subsistence strategy (Keyser and Davis 1984:57). Keyser (1985; Keyser and Davis 1984; 1985) has suggested that this approach is flawed and that it does not adequately address the variability seen in the archaeological record. He argues that

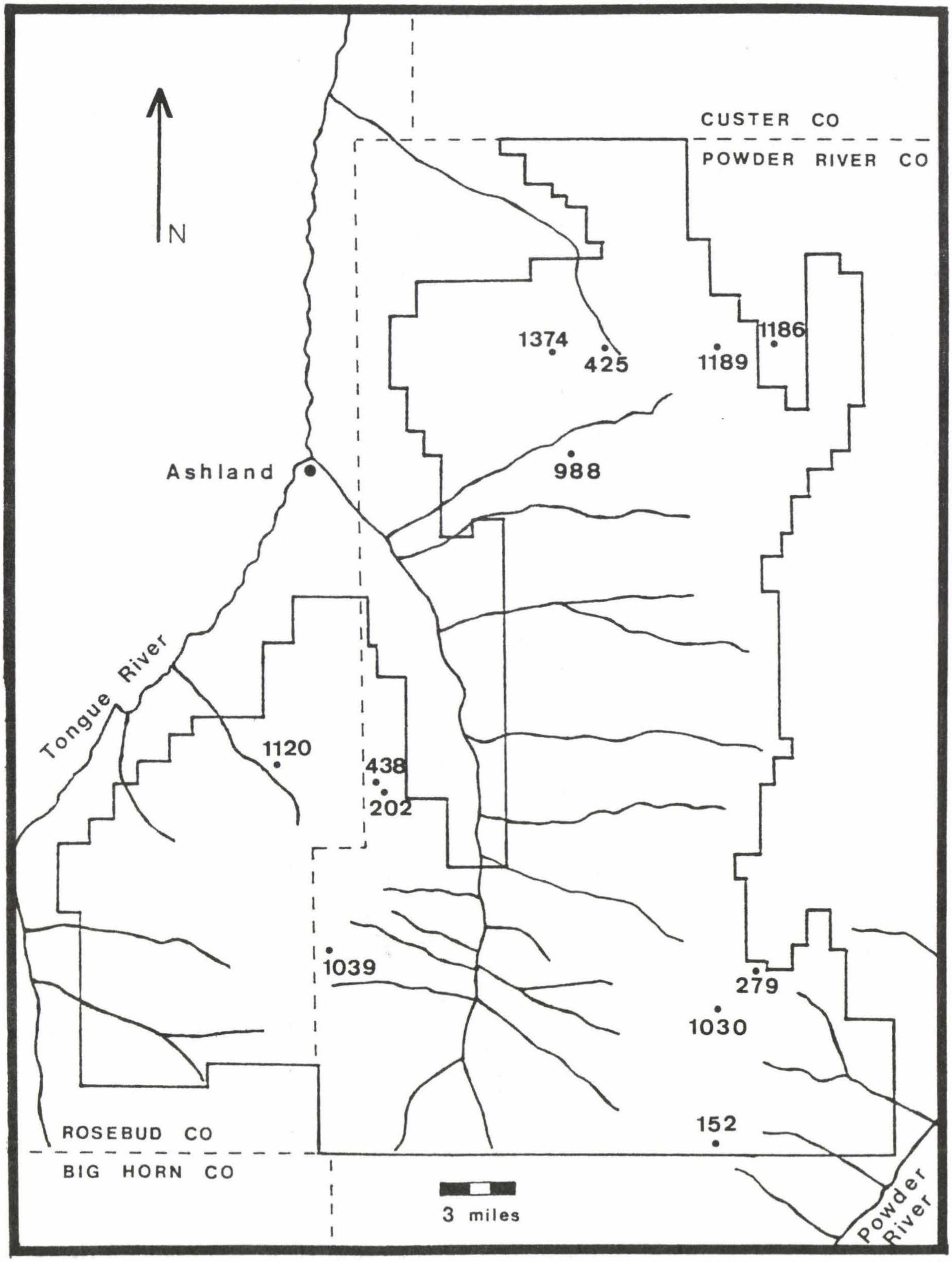

N
CUSTER CO
POWDER RIVER CO
1374
425
1189
1186
Ashland
988
Tongue River
1120
438
202
1039
279
1030
152
ROSEBUD CO
BIG HORN CO
3 miles
Powder River

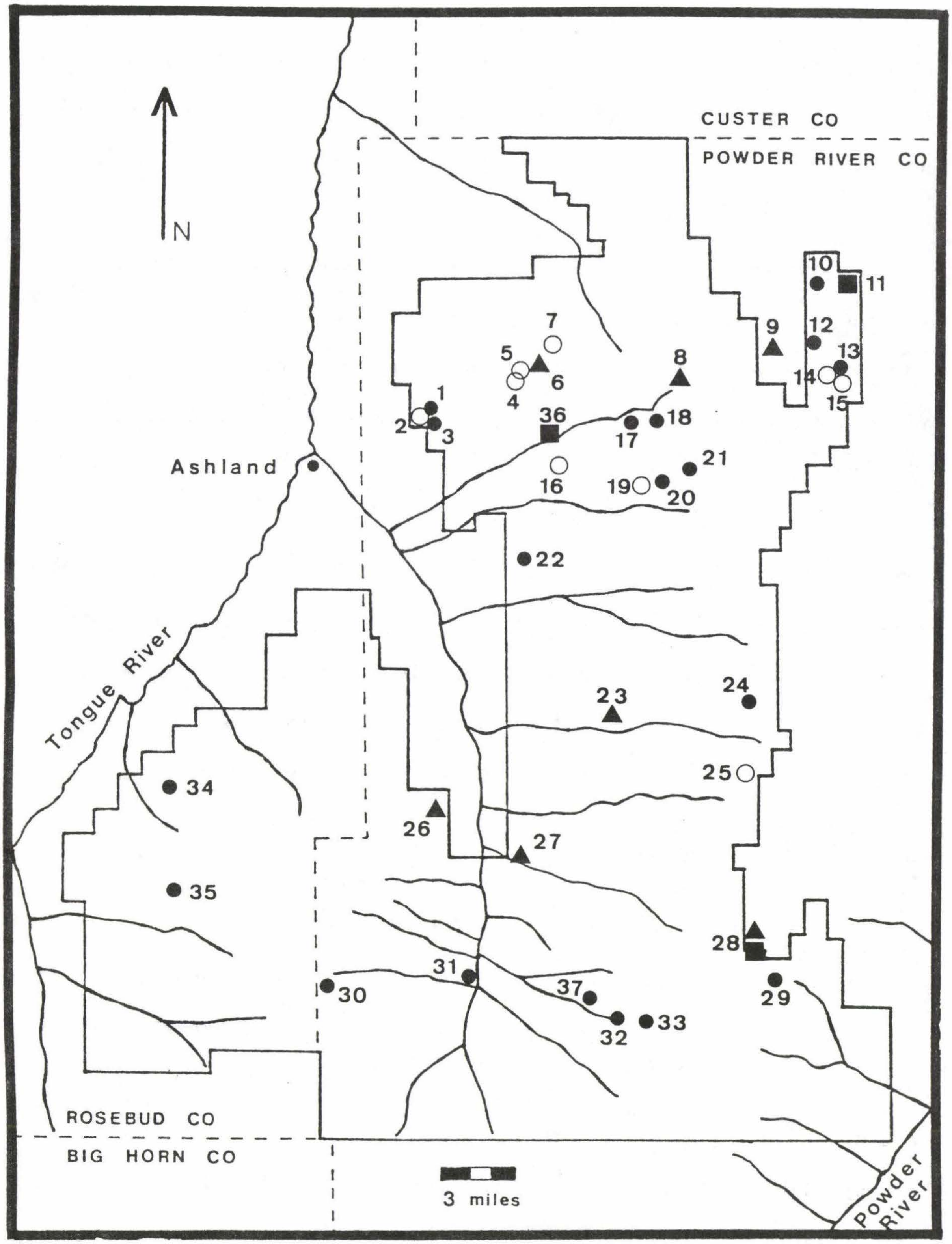
FIGURE 9
Middle Archaic Period Sites.
Sites in Powder River Co. are numbered 24PR---.
Sites in Rosebud Co. are numbered 24RB---.

McKean should be approached from the perspective of many localized groups, each utilizing a different subsistence strategy which is appropriate for their area. In order to understand the McKean Complex as a whole, it is first necessary to determine those local adaptations and patterns which exist.

A total of 12 McKean complex sites (Figure 9) have been recorded on the Ashland District. These sites are fairly evenly spread throughout the various ecozones on the District, however, mesic grassland ecozones are by far the most heavily utilized as a group. Most McKean sites are found on terraces and within 1,000 feet of the closest water source. There does not appear to have been any preference for a particular aspect. No McKean sites are found at elevations below 3,400 feet, but, despite this fact the sites do not cluster in the higher elevations. The lowest elevations are along the Tongue and Powder Rivers and along the larger streams, so it appears that the McKean people were not using these areas, preferring instead the tributary streams.

LATE ARCHAIC PERIOD - 3,000 to 1,800/1,200 B.P.

A total of 38 components (Figure 10) on the Ashland District have been assigned to the Late Archaic Period. Four cultural complexes within the Late Archaic are known to have utilized the District to some extent. These complexes include Pelican Lake (7 sites), Yonkee (3 sites), Besant (9 sites), and an unnamed complex (19 sites). While the interrelationships between the various groups are not clear, it appears that the Late Archaic can be separated temporally into two parts, with two complexes (Pelican Lake, Yonkee) dating prior to A.D. 100, and two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CUSTER CO
POWDER RIVER CO
Ashland
Tongue River
ROSEBUD CO
BIG HORN CO
3 miles
Powder River
1
2
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6
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FIGURE 10
Late Archaic Period Sites. Open circles - Besant Complex, triangles - Pelican Lake Complex, squares - Yonkee Complex, dots - One Bear Complex. Site number key is on next page.

Key to Figure 10, Late Archaic Sites on the Ashland Ranger District.

1. 24PR1162 - One Bear Complex
2. 24PR1163 - Besant Complex
3. 24PR1160 - One Bear Complex
4. 24PR1399 - Besant Complex
5. 24PR1397 - Besant Complex
6. 24PR1368 - Pelican Lake Comp.
7. 24PR1372 - Besant Complex
8. 24PR1026 - Pelican Lake Comp.
9. 24PR1186 - Pelican Lake Comp.
10. 24PR1142 - One Bear Complex
11. 24PR843 - Yonkee Complex
12. 24PR1188 - One Bear Complex
13. 24PR1033 - One Bear Complex
14. 24PR1134 - Besant Complex
15. 24PR1139 - Besant Complex
16. 24PR991 - Besant Complex
17. 24PR1181 - One Bear Complex
18. 24PR1178 - One Bear Complex
19. 24PR1196 - Besant Complex
20. 24PR853 - One Bear Complex
21. 24PR188 - One Bear Complex
22. 24PR607 - One Bear Complex
23. 24PR1067 - Pelican Lake Comp.
24. 24PR1235 - One Bear Complex
25. 24PR270 - Besant Complex
26. 24PR217 - Pelican Lake Comp.
27. 24PR601 - Pelican Lake Comp.
28. 24PR279 - Yonkee Complex
    - Pelican Lake Comp.
29. 24PR160 - One Bear Complex
30. 24PR201 - One Bear Complex
31. 24PR441 - One Bear Complex
32. 24PR1041 - One Bear Complex
33. 24PR151 - One Bear Complex
34. 24RB1073 - One Bear Complex
35. 24RB1077 - One Bear Complex
36. 24PR1308 - Yonkee Complex
37. 24PR402 - One Bear Complex

(Besant, the unnamed complex) dating after A.D. 1. Each of these complexes will be discussed separately.

Yonkee complex

The Yonkee complex is poorly represented on the Ashland District, although the type site is located just south of the District. Yonkee is fairly widely scattered, but is not well understood. Bump (1987: Fig. 3) reports a total of seven Yonkee sites, almost all of which are kill sites. Published descriptions are available for the following Yonkee sites: Powers-Yonkee (Bentzen 1962; Bump 1987), Kobold Level II (Frison 1970), Powder River (Frison 1968a), and 48SH311 (Frison 1978:205-208). A total of three Yonkee sites have been recorded on the Ashland District, all of which are campsites. Very little is known about the Yonkee people other than that they had a heavy reliance on bison. While previously thought to be Middle Archaic in age, the Yonkee complex is securely dated between 1,000 B.C. and A.D. 1 (Bump 1987).

While three sites would normally be too small a sample from which to make generalizations, it should be pointed out that the total Late Archaic sample is 38 sites. This suggests that the small number of Yonkee sites is not the result of sampling error, but rather, an accurate representation of the presence of Yonkee on the District. All three sites are located on terraces. Two of the sites are situated in the Stream Terrace ecozone, while the third site is in the Upland Prairie ecozone. Both of these ecozones can, however, be classified as mesic grassland. There do not appear to be any patterns as far as preference for aspect, elevation, or proximity to water.

Yonkee sites can be found over quite a geographical area, but do not appear to be very dense in any part of the Northwestern Plains. It is likely that Yonkee represents a localized manifestation (Frison 1978:55-56) with only a limited population. The Yonkee complex people may have been highly mobile hunters who did not stay in one place for any length of time.

Pelican Lake complex

The Pelican Lake complex is a geographically widespread, but poorly understood cultural manifestation. For example, there is not a standard definition of what a Pelican Lake point is supposed to look like beyond the fact that it is corner-notched. Projectile points of quite different appearance have been called Pelican Lake. Furthermore, no typical assemblage has been defined for Pelican Lake (Keyser and Davis 1984:51-52). In general, Pelican Lake has been dated between 1,000 B.C. and A.D. 100 (Beckes and Keyser 1983:281).

One feature of Pelican Lake adaptation which has been deduced is the settlement pattern (Keyser and Davis 1984:44-45, 53-54). Most sites appear to represent small, short term campsites, usually in creek bottom grasslands or on high terraces with a good view of the surrounding area. Bison kills and processing stations represent the other recorded Pelican Lake site types. It appears that the Pelican Lake people were very mobile hunters who focused on bison as their main food source. Most sites have been recorded on the open plains.

This pattern is also seen on the Ashland District. Four of the seven sites are located on stream terraces, while the other three sites are located on high ridges. The Stream Terrace, Open Hillside, and Upland Prairie ecozones each contain one Pelican Lake site. Three sites are found in the Dry Slope Ponderosa Pine. Forested areas make up a predominance of site locations, followed in order by mesic grasslands and xeric grasslands. While the high number of sites in forested areas contrasts with the pattern found elsewhere, these sites are situated on a high, wide ridge system which provides an excellent view of the surrounding country. This last feature, a good view of the surrounding country, is typical of Pelican Lake sites. Pelican Lake sites most frequently are found within 1,000 feet of a good water source and in the lower elevations.

One Bear complex

The greatest representation of a Late Archaic complex on the Ashland District is by a complex which has not been formally defined or named. This complex is suggested to represent a population indigenous to the Pine Parklands (Beckes and Keyser 1983:282-285; Keyser and Davis 1981:114-168) and appears to be a distinct, localized complex. Nineteen sites on the Ashland District have been assigned to this complex. It is here suggested that this complex be referred to as the One Bear Complex, after the site which was excavated on the Ashland District in 1979 (Keyser and Davis 1981). A brief description of this complex based on published sources follows.

Excavated sites which have been assigned to this complex include One Bear (24PR402) (Keyser and Davis 1981), Skinner Gulch (24PR1235) and U.D. Spring (24PR607) (McLean 1976), Horse Shelter (24RB1011) and Colt 45 Shelter (24RB1012) (D. Fredlund 1973), and Kobold Level III (Frison 1970). Beckes and Keyser (1983:282) have also suggested that related sites from outside the Pine Parklands may include Spring Creek Cave (Frison 1965), Dougherty Cave (Frison 1968b), and Mummy Cave (Wedel et al. 1968).

It is suggested that the One Bear Complex dates from at least A.D. 1 to A.D. 800. A radiocarbon date of A.D. 710±65 (Tx-3690) was obtained from the One Bear site (Keyser and Davis 1981:154) and a date of A.D. 640±110 was obtained from U.D. Spring (McLean 1976:28). Frison (1970:32) reports obsidian hydration dates from Kobold Level III of A.D. 316 and 582 B.C., and Keyser and Davis (1981:165) suggest that the later date (A.D. 316) may be the more accurate date. The occupations at the Colt 45 and Horse Shelters are dated between A.D. 1 and 800 (D. Fredlund 1973:65; Keyser and Davis 1981:164).

The projectile points which characterize this complex are small, bulky, side and corner-notched dart points. Keyser and Davis (1981:123) describe the points from the One Bear site as being of good workmanship "with broad, shallow flake scars. Bases are thinned and heavily ground. Neck widths of the three measurable specimens are 10.5, 12, and 15mm." The projectile points recovered from Kobold Level III are described by Frison (1970:16) as having primarily straight to concave bases showing light to heavy grinding. There are a few slightly concave bases with a small amount of light grinding. Notches can be narrow to wide and shallow or deep. A few narrow or oblique notches also occur. Almost all blade edges are convex (Frison 1970:16). Many of the points have an asymmetrical appearance which

Frison (1970:16) suggests is caused by use as tools other than strictly projectile points. Intentional and use retouch of the points is common.

Most sites are small in size and have a limited tool inventory, which is not as diverse as those of other contemporaneous groups. Beckes and Keyser (1983:284) suggest that most sites represent short-term activity oriented uses. The One Bear site was probably occupied by no more than 15-25 people (Keyser and Davis 1981:159-164) and Beckes and Keyser (1983:283-284) suggest that this is probably typical of all sites of this complex in general. An exception to this would be the Kobold site, which represents the joining together of several small groups.

Interaction with outside groups likely was limited. Evidence supporting this hypothesis comes from two sources. One is the lithic assemblage found in most sites. An overwhelming majority of the lithics recovered at the One Bear site (81%) are made from local material (porcellanite and fused glass). The chert and quartzite present is a type which is commonly available in the gravel deposits of the Tongue, Powder, and Yellowstone Rivers (Keyser and Davis 1981:134-135, Table 3). At the Kobold site, porcellanite is also the most common raw material type, with Level III showing the least amount of non-local material of the four levels (Craig 1983:75).

The other piece of evidence which suggests that the local inhabitants had limited contact with outsiders is the fact that they were still using dart points as late as A.D. 700, although the bow and arrow appeared on the Northwestern Plains around A.D. 200 (Keyser and Davis 1981:165-166). Frison (1978:223-224) suggests that the bow and arrow would have been adopted by the populations which came into contact with it quite rapidly. The bow and arrow were widely in use on the Plains by A.D. 500 (Frison 1978:62; L. Fredlund 1981:40). This fact has led Keyser and Davis (1981:166) to argue that the One Bear complex had limited interaction with outside populations.

Regarding the settlement pattern, One Bear sites are found in all ecozones on the Ashland District except for the Creek Bottom and Moist Slope Ponderosa Pine ecozones. No sites of any kind have been recorded in the Creek Bottom ecozone, and only 2% of all sites on the District are found in the Moist Slope Ponderosa Pine ecozone. The most heavily used ecozone is the Stream Terrace ecozone, with one third of the sites, and the Open Hillsides ecozone is the next most frequently used. Together these two ecozones account for 53% of the One Bear complex sites on the District. Dry Slope Ponderosa Pine and the Upland Prairie ecozones are used with equal frequency, with the least utilized ecozones being the Scoria Outcrop and Grassland Parks. A large majority of the sites (N=14) are found on stream terraces. Proximity to water appears to have been an important factor in site locations, as 11 of the 18 sites are located less than 1,000 feet from the nearest reliable water source. Approximately one half of the sites are situated in the lower elevations (less than 3,700 feet). Sites most frequently face in a general southern direction (south, southwest, or southeast).

When the ecozones are combined into the macro-units suggested by Taylor (1976:46), it can be seen that the One Bear complex people most heavily utilized the mesic grassland areas. Ten of the 19 sites, or 52.6%, are located in such ecozones. Xeric grasslands (31.6%) are the next most frequently used, while forested areas account for 15.8% of the sites. It appears that the One Bear people were utilizing all parts of the local ecosystem. The faunal remains excavated at the One Bear site indicate that they did not rely exclusively on bison for their food source. Bone recovered from this site indicates that medium sized animals, possibly dog and deer, were being eaten. In addition, small animals, as shown by the burned and butchered bones of a ground squirrel probably were also part of the diet. The conditions of these bones indicates that they had been processed for grease (Keyser and Davis 1981:137-138). It is likely that the people of the One Bear complex existed on a broad-based hunting and gathering economy. While bison were a part of their diet, as evidenced by the Kobold site, it was not the major part of the diet.

Besant complex

The Besant complex is the second most common of the Late Archaic complexes on the Ashland District. Besant can be found throughout the entire northern part of the Great Plains. Dates associated with the Besant complex range from 400 B.C. to A.D. 800, with most occurring between A.D. 1 and 600 (Johnson 1970:58; Morlan 1988). Besant has long been considered to be rare in the Pine Parklands, based partly on Beckes and Keyser's (1983:281) report that only two sites occur on the Ashland District (see Fraley 1988). This total, however, has now risen to nine. These nine sites, combined with Fraley's (1988:133) count of 23 other Besant sites south of the Yellowstone River and west of the Powder River, results in a total of 32 Besant sites in the northern Powder River Basin. While not indicating an occupation as heavy as that in the rest of eastern Montana, which has 52 recorded Besant sites (Fraley 1988:133), this certainly indicates a much heavier occupation than was previously believed.

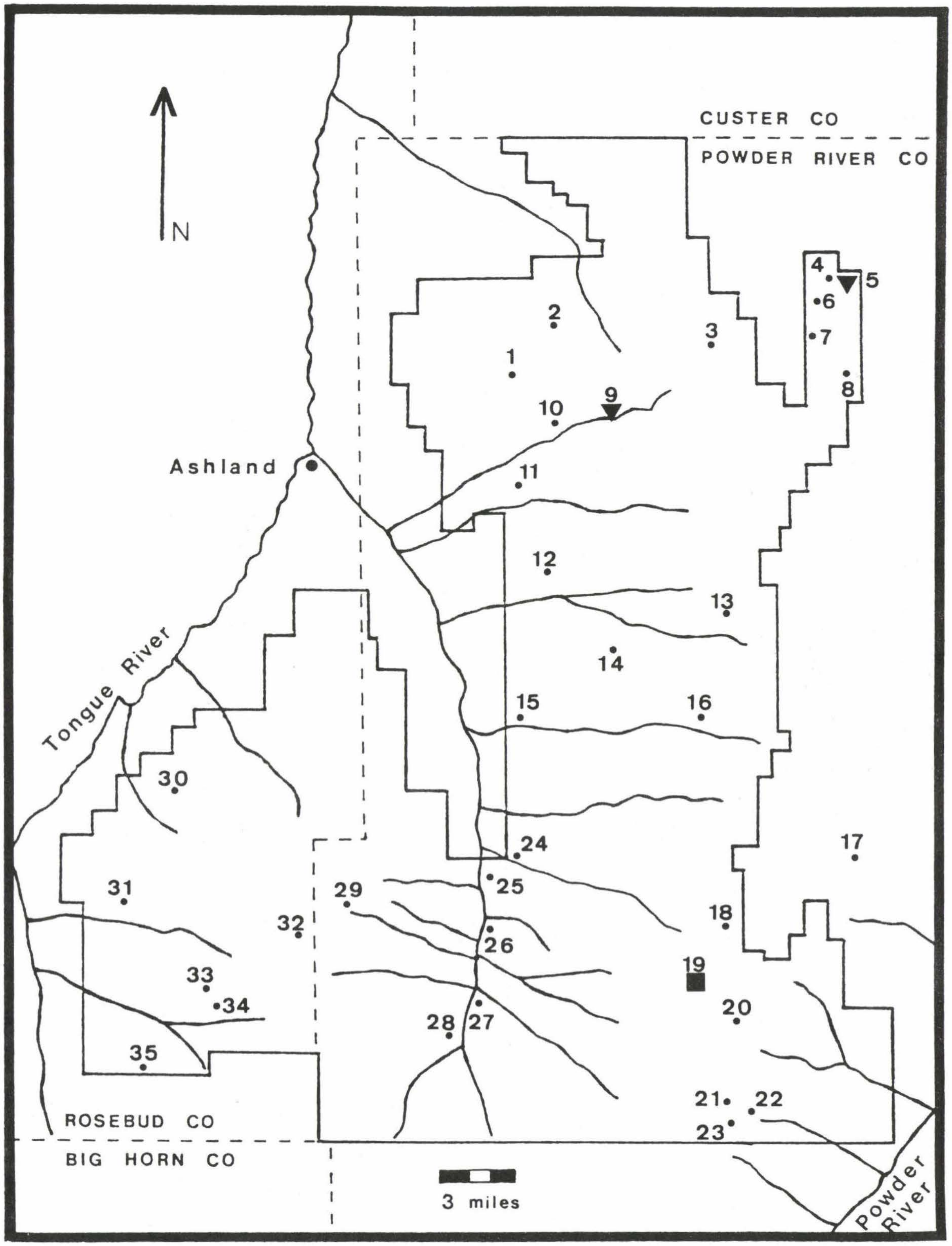
Two explanations have been presented to explain the lack of Besant sites in the Pine Parklands. One possible explanation is that the people of the One Bear Complex were hostile to non-local groups (L. Fredlund 1987:224). An alternative explanation for the lack of Besant sites in the Pine Parklands, especially in the northern Powder River Basin, is that bison hunting is poor in this area (Beckes and Keyser 1983:281; Fredlund 1987:224). Evidence exists, however, which conflicts with this hypothesis. One piece of evidence is that Besant appears to be more common than was previously thought, thus casting serious doubt on this hypothesis. The other piece of evidence is that there is a growing amount of data which suggests that Besant groups subsisted on a much broader diet than previously believed. Data recovered from Besant sites in the Black Hills do not indicate a heavy reliance on bison, but rather, a varied diet (Sundstrom 1989:60). If this is the case in the Black Hills which are quite similar in many ways to the Pine Parklands, then there is no reason why Besant in the Pine Parklands could not also have utilized a diverse economy. Fraley (1988:133) reports that one Besant site along the northern Powder River contained evidence for the use of prairie dog, deer, antelope, and elk, thus supporting this argument. Herbort and Munson (1984:96-99) report the presence of antelope, rabbit, marmot, bison, and possibly several other small mammals at a Besant site near Colstrip. Hughes (1989) has recently suggested that the pattern of communal bison hunting proposed for Besant in the past is but one aspect of the Besant subsistence base.

On the Ashland District, Besant sites are found in a variety of ecozones, but most frequently in the Open Hillsides ecozone (33.3%) and in xeric grasslands (44.4%). Mesic grasslands (33.3%) and forested areas (22.2%) are utilized less often. A majority of Besant sites (55.6%) are found between 3,400 and 3,700 feet in elevation, on ridges (66.7%), and with an open aspect (66.6%). Besant sites generally occur at distances of greater than 1,500 feet from the nearest water source.

LATE PREHISTORIC PERIOD - 1,800/1,200 to 250 B.P.

A total of 35 Late Prehistoric Period sites have been recorded on the Ashland Ranger District (Figure 11). Of these 35 sites, two have been classified as Avonlea, while the other 33 can only be classified as Late Prehistoric point styles. One of these sites (24PR627) contains pottery and is associated with the Powder River Ceramic Tradition (Davis and Keyser 1982; Keyser and Davis 1981; 1982). Avonlea and the Powder River Ceramic Tradition are the only accepted complexes which have been defined for this region during the Late Prehistoric Period. L. Fredlund (1987) has defined a complex for this period (the Big Sky Complex), but as was discussed in Chapter Three, there are problems with this definition and it will not be used here.

The Avonlea complex is represented by two sites on the District. All Avonlea style points recovered on the District are classic Avonlea points (M. Hill personal communication 1989) and do not appear to be associated with the Beehive complex, an Avonlea variant which is found to the south (Frison 1988; Fredlund 1981; 1987; 1988). Both of these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CUSTER CO
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Tongue River
ROSEBUD CO
BIG HORN CO
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FIGURE 11
Late Prehistoric Period Sites. Triangles - Avonlea Complex, square - Powder River Ceramic Tradition, dot - no assigned complex. Site number key is on next page.

Key to Figure 11, Late Prehistoric Sites on the Ashland Ranger District.

1. 24PR1397
2. 24PR1387
3. 24PR1189
4. 24PR828
5. 24PR843 - Avonlea
6. 24PR1237
7. 24PR1188
8. 24PR1139
9. 24PR1242 - Avonlea
10. 24PR1307
11. 24PR1149
12. 24PR1217
13. 24PR1231
14. 24PR1229
15. 24PR1058
16. 24PR1071
17. 24PR1045
18. 24PR1032
19. 24PR627 - Powder River Ceramic Tradition
20. 24PR1042
21. 24PR236
22. 24PR238
23. 24PR245
24. 24PR601
25. 24PR604
26. 24PR603
27. 24PR796
28. 24PR1038
29. 24PR1028
30. 24RB1073
31. 24RB1510
32. 24RB1080
33. 24RB1082
34. 24RB1075
35. 24RB175

Avonlea sites are located in the northern part of the District. Avonlea sites are very rare in southeastern Montana in general, and even more so in the northern Powder River Basin (Fraley 1988). In the Missouri Basin, which includes eastern Montana and the western parts of North and South Dakota, Avonlea dates between A.D. 300 and 1200. The Beehive complex appears to be roughly contemporaneous (Morlan 1988).

On the Ashland District, Avonlea sites are found between 3,400 and 3,700 feet in elevation, and away from water sources. Such a small number of Avonlea sites compared with the other defined complexes suggests that the use of the Ashland District by Avonlea people was infrequent and brief.

Several patterns can be seen for the remaining Late Prehistoric Period sites on the Ashland District. Mesic and xeric grassland ecozones are utilized with an equal frequency. Forested ecozones are exploited, but with less frequency than the grasslands. Ridgetops are the most common setting for sites, with terraces the next most common. In contrast with the earlier complexes, Late Prehistoric Period sites quite frequently are located on isolated buttes. Butte-top settings represent nearly one quarter of the Late Prehistoric sites. This is a significant change in site locations which has yet to be explained. In contrast to earlier time periods, a majority (57.1%) of Late Prehistoric Period sites are located in the higher elevations, above 3,700 feet. This is exactly the opposite of the findings of previous studies by Beckes (1976) and Munson and Anderson (1982).

Two Late Prehistoric complexes have been defined for this area, but these account for only three of the 35 Late Prehistoric sites. The other 32 sites can not at this time be dated much more accurately than to simply say they are Late Prehistoric in age. If the population movements observed in Montana during the Historic Period (Hewes 1948; Malouf 1968) are any indication of what occurred during the rest of the Late Prehistoric, then there would have been several groups using the Pine Parklands. Each of these groups would most likely have used the local environment and resources in different ways. A number of these sites probably represent the Powder River Ceramic Tradition, but at this time sites can only be assigned to this tradition if they contain ceramics, which are quite rare. A similar problem involves the contrast between ceramic-bearing Plains Woodland sites and aceramic Besant sites, which probably represent the same people (Johnson 1977). Four different Late Archaic complexes have been defined, and there are differences between these complexes in their utilization of the environment. This fact results in it being hard to make accurate comparisons between the Late Archaic and Late Prehistoric Periods for purposes of determining changes in land use patterns.

Any detailed discussion of a generalized Late Prehistoric Period patter of land use is probably not accurate and would not provide a true indication of what occurred at this time. It is certain that several groups utilized this area during the Late Prehistoric Period. As was the case with the Late Archaic, each group probably utilized the area in ways different from each of the other groups. Combining all Late Prehistoric sites together would present a distorted picture in the same way that combining all Late Archaic groups would not provide an accurate record of that period.

ASHLAND RANGER DISTRICT: 1000 B.C. TO A.D. 1000

The archaeological record for the Ashland Ranger District for the period between 1000 B.C. and A.D. 1000 is most open to analysis and interpretation when compared to the other time periods. This was the time of the heaviest occupation and the time with the most clearly defined complexes. Other periods are either characterized by sparse occupations (i.e., Paleoindian) or by a lack of clearly defined complexes (i.e., Late Prehistoric). Because of these factors, the time between 1000 B.C. and A.D. 1000 is the only time for which definite patterns can be described. A total of five defined complexes can be found in the Pine Parklands during this period. These complexes are: Pelican Lake, Yonkee, Besant, One Bear, and Avonlea. Pelican Lake and Yonkee have been dated between 1000 B.C. and A.D. 100, while the other three complexes date after A.D. 1.

Only recently have archaeologists on the Northwestern Plains moved away from the emphasis on culture history to attempt to explain variability in the archaeological record (Keyser 1985:85-86; Sundstrom 1989:79). Two major factors have led to the focusing on who lived where and when. One very important factor in the Pine Parklands has been a lack of data. It is only in the last few years that enough data has been accumulated so that one can begin to analyze why people lived where they did. The other important reason has been the nature of the archaeological record (Keyser 1985:86; Frison 1978:16-18). Few changes in cultural complexity are evidenced in the archaeological record and, as the inhabitants were all hunters and gatherers, there was not an elaborate material culture. Projectile point types and styles are about the only artifacts clearly changing through time. Other artifacts also experienced change over time, but these changes have not been clearly defined at this point. A problem related to minimal recognized artifact variability over time is that most sites (81% on the Ashland District) cannot be dated without excavation because they do not contain diagnostic artifacts on the ground surface. As a result of these problems it is only with the accumulation of a large body of data that hypotheses can be presented concerning aspects of the archaeological record beyond culture history. Currently, sufficient data exists on the Ashland District to allow interpretations to be made beyond analyzing who lived where and when.

Very few attempts have been made to interpret the data which has been generated in the Pine Parklands. Data have accumulated over the last 15 years primarily through surveys conducted for strip mining or through work carried out on the federal lands to comply with Section 106 of the National Historic Preservation Act. L. Fredlund (1981; 1987; 1988) has addressed the Avonlea occupation of the southern part of this region (the Beehive complex). She has also provided a general discussion of the Late Prehistoric Period based on the data generated by the coal related surveys. Keyser and Davis (1981; 1982) have presented hypotheses concerning the One Bear complex and the Powder River Ceramic Tradition.

Recently, Deaver and Deaver (1988) have presented an overview of the prehistory of southeastern Montana. This document was developed to assist the CRM program of the Miles City District of the Bureau of Land Management and deals with that part of Montana south of the Missouri River and east of the Musselshell, Bighorn, and Little Bighorn Rivers (Deaver and Deaver 1988:1). As a result, the area discussed by Deaver and Deaver is much greater in extent than the Pine Parklands. It is a useful document for making comparisons on a regional basis as the area under consideration includes a variety of ecological and topographical zones. The area of the Ashland District is only a small part of the region covered by this overview.

The most complete summary of the prehistory of the Ashland area of the Pine Parklands is found in Beckes and Keyser (1983). This last publication was developed as an overview of the archaeology of the Custer National Forest to assist in managing the cultural resources on Forest Service land and is similar in purpose to Deaver and Deaver (1988). The Custer National Forest manages lands in an area extending from the Beartooth Mountains on the border of Yellowstone National Park in south-central Montana to the Sheyenne Grasslands, near the North Dakota - Minnesota border. As a result of the nature of this work, the discussions of each period are necessarily brief. It is an excellent overview, but a large body of additional data has been generated on the Ashland District in the years since its publication. Despite the fact that the Late Archaic Period is the time of the heaviest occupation of the Pine Parklands, no review of this time period has been presented beyond the brief one presented in Beckes and Keyser (1983:280-285). As was mentioned above, the time with the most complete record is from 1000 B.C. to A.D. 1000, and the following discussion of land use patterns will focus on this period.

The archaeological record of this 2,000 year period reflects interaction between the different groups of people who lived in the area. Two groups, Pelican Lake and Yonkee, utilized this region from 1000 B.C. to A.D. 100. Three groups (Besant, One Bear, and Avonlea) were found in this area between A.D. 1 and 1000. When examining the pattern for site locations during this time one pattern is quite apparent; the groups which were contemporaneous utilized different parts of the environment.

During the period between 1000 B.C. and A.D. 100, the Pelican Lake people utilized the forested areas more than any of the other environmental zones. In contrast, Yonkee sites are found exclusively in mesic grasslands. For the period from A.D. 1 to 1000, the One Bear complex most frequently utilized the mesic grasslands, and with much less frequency, the xeric grasslands and forested areas. Besant sites most commonly appear in the xeric grasslands and less frequently in the mesic grasslands and forested areas. Avonlea sites are quite rare, with only two recorded sites. In addition, One Bear sites are most frequently found less than 1,000 feet from the nearest water source, while Besant and Avonlea sites tend to be located away from good water sources.

This pattern of site distributions can best be explained by the Co-Influence Sphere model developed by Syms (1977). According to Syms (1977:5):

> "In a region . . . where there is evidence for contemporaneous utilization by numerous ethnographic groups from a variety of near-by areas (influencing one another either through positive interaction or a negative pattern of avoidance), the region can be analyzed most readily as a Co-Influence Sphere, rather than as an isolated region with a unilinear chronology. The concept of the Co-Influence Sphere . . . emphasizes the importance of a constant consideration of more than one ethnic group at any season or year in a region."

The Co-Influence Sphere model consists of three main areas utilized by each group (Syms 1977:5-6). Every group has a core area. This is the area in which a group spent most of the year or to which they habitually returned for part of the year. A secondary area is a region which was exploited for a particular resource. These areas were used only part of the year, and frequently only by specialized groups. Tertiary areas are the regions which are only infrequently utilized. A fourth category discussed by Syms (1977:6) is an intrusion, which is an infrequent visit to an area by a distant group of people.

The Co-Influence Sphere model assumes that contemporaneous groups will interact. This can be in a positive or negative manner. For example, a positive influence would be one group adopting some trait or behavior from another group, while a negative interaction would be one group attempting to avoid another. These interactions will affect the subsistence-settlement systems of the various groups who interact. Several groups can utilize the same area at the same time, but will use different subsistence-settlement systems (Syms 1977:6-8).

It previously has been suggested that the One Bear Complex was indigenous to the Pine Parklands (Beckes and Keyser 1983:282-285; Keyser and Davis 1981:165-166). Keyser and Davis (1981:166) also suggest that this complex had few secondary and tertiary areas as defined by Syms (1977:6). One Bear Complex sites are found in all ecozones on the District, but most frequently in the mesic grasslands, close to water, and on terraces. Sites of the contemporaneous Besant complex are found most frequently in xeric grasslands, on ridges, and away from water sources. One Bear and Besant populations were obviously exploiting different parts of the environment. The mesic grasslands are the most productive and are generally found closer to good water sources than are the xeric grasslands. Xeric grasslands are, however, the primary winter range of the big game animals found in the area. This differential utilization of the environment is predicted by the Co-Influence Sphere model.

Two possible explanations can account for this difference, both of which can be incorporated within the Co-Influence Sphere model. One explanation is that the two groups were exploiting the area in different ways. For example, Besant sites being located primarily in xeric grasslands, which are the primary winter range for big game animals, may indicate that Besant people exploited this area primarily in the winter. In contrast, One Bear complex people may have lived in the area year round with an emphasis on the mesic grasslands for habitation sites year round, or they may have moved to another area in the winter. An alternative explanation is that one group (One Bear) was indigenous and exploited the most productive parts of the environment (located close to water and in mesic grasslands). The other group (Besant) would then have been forced to utilize a different (less productive) part of the environment. Using either approach, it can be suggested that the One Bear complex had the Pine Parklands as a core area, while this region was a secondary area for Besant.

Avonlea is much less common than the other complexes in the Pine Parklands and is also assigned dates which are somewhat later than those of the other two complexes. A majority of Avonlea sites occur in the higher elevations and away from water sources. While Avonlea sites are infrequent in the area and may date somewhat later than the other two complexes described above, it is clear that the Avonlea utilization of the environment was different than that of the other complexes and also quite infrequent. It is suggested here that the pattern of use of the Pine Parklands seen for Avonlea represents that of a tertiary area or intrusion as defined by Syms (1977:6).

Two complexes (Pelican Lake and Yonkee) utilized the Pine Parklands during the period from 1000 B.C. to A.D. 100. As with the later period discussed above, these complexes utilized different parts of the environment. Yonkee sites are rare and found exclusively in mesic grasslands and on terraces. Pelican Lake sites are most frequently found in forested areas, and less frequently in mesic and xeric grasslands. A majority of Pelican Lake sites are found on terraces. It is likely that neither complex utilized the Pine Parklands as a core area, but rather, as secondary or tertiary areas.

DISCUSSION

While the part of the archaeological record from 1000 B.C. to A.D. 1000 is the clearest for the Ashland District, this is not to say that hypotheses concerning the other periods can not be presented. Few sites are found on the District from any of the Paleoindian or Early Archaic complexes. Two possible explanations can account for this lack of sites. The first explanation is that the archaeological record does not reflect the nature of the occupation of this area by these complexes as a result of the destruction of sites by erosion or burial. An alternative explanation is that the Pine Parklands were only infrequently occupied during this time; used, perhaps, as secondary or tertiary areas as defined by Syms (1977:5-6).

A problem exists, however, with the Middle Archaic Period. It is not known whether the various point styles assigned to the McKean complex represent different contemporaneous groups of people, different groups living at different times, or one group using different styles of points. Until more is known about the McKean complex itself, it is not possible to interpret the McKean occupation of the Pine Parklands.

A similar problem exists for the Late Prehistoric Period (excluding Avonlea). It is known that several tribal groups (Crow, Shoshone, Cheyenne, Teton Dakota) occupied this region in prehistoric and historic times, but it is not possible to differentiate between these groups in the archaeological record. Until a way is found to separate the various groups archaeologically, it is not possible to present a detailed assessment of Late Prehistoric land use patterns in the Pine Parklands.

CHAPTER 8

CONCLUSIONS

The archaeological record of the Pine Parklands can best be viewed as the record of interactions between the various groups of people which lived in the area. Such interactions contribute to the changes in culture and adaptation seen in the archaeological record. Many different factors, including cultural, historical, and environmental, result in the patterns recovered by archaeologists (Hodder 1982; Schiffer 1987; Syms 1977:5-8; Sundstrom 1989:78-81). Only through careful examination and comparison can the meaning of this pattern be elucidated.

This study provides an initial step on the road to understanding the archaeological record of the Pine Parklands, and in particular, the area of the Ashland District. It provides an outline of which groups used this area and when this would have occurred. Preliminary hypotheses are presented to explain the nature of that use. This can best be seen during the period between 1000 B.C. and A.D. 1000, when five different groups of people used this region. These people were not isolated from one another and the presence of other groups affected the patterns of behavior and land use of each group. These different patterns are visible in the archaeological record and have been described in this study. It remains, however, to explain the exact causes or reasons for this pattern. As with any study, more questions are raised than answered. Answering these questions must await further research.

One of the greatest problems encountered when examining the archaeological record of the Pine Parklands is the lack of data beyond that generated by large scale surveys. Few sites have been excavated (exceptions being Bentzen 1962; Bump 1987; Davis and Keyser 1982; L. Fredlund 1979; Frison 1970; Herbort and Munson 1984; Keyser and Davis 1981; 1982) and it is only through excavation that questions concerning such aspects of culture as social organization and subsistence can be answered. Many researchers have presented hypotheses concerning the subsistence patterns in the region (Beckes 1976; D. Fredlund 1973; L. Fredlund 1981; Greiser 1981; Waldman 1979) and there are almost as many hypotheses as there are researchers. Subsistence hypotheses would benefit from the collection of substantive data on the flora and fauna that were exploited. Adequate data on the paleoenvironment of the Pine Parklands are also lacking. Such data is necessary for an accurate analysis of the archaeological record.

An additional problem of great importance exists for analyzing the archaeological record in the Pine Parklands. Any conjectures made concerning time specific events or actions must necessarily ignore a large majority of the recorded archaeological sites. On the Ashland District, fully 81% of the known sites can not be assigned a chronological placement based on surface indications and therefore cannot be used in studies for which time is an important factor. In order to understand the settlement-subsistence system of a group of people, it is necessary to know all of the ways in which that group interacts with their environment - both cultural and geographical. A settlement system can be described as "the relationship between contemporaneous sites whose inhabitants were interacting in systemic fashions" (Plog and Hill 1971:9). Until a way is found to determine the relationships between all of the sites in the area, any attempt at defining a settlement system must be considered incomplete.

A problem which is related to determining the ages of sites is determining how each site was used. Many researchers working in the area have attempted to define the functions of each site, for example, base camps, short term camps, lookout sites, etc. Almost all of these definitions are based on the locations of sites and the types and numbers of artifacts present at the site. Such an approach to defining site functions has come under increasing criticism in the last few years (Binford 1982; Jones et al. 1983; Thomas 1986:241-242; among others). The size of the sample examined often affects the diversity of artifacts observed (Jones et al. 1983) and hunter-gatherer mobility patterns are quite complex. A single site may be utilized for several different purposes by the same group of people (Binford 1982). As Binford (1983a:131-132) has noted, "in order to reconstruct the entire pattern of land use, archaeologists have to be able first to identify the specific function of each separate site and then to fit all the individual parts together." By relying on simplified functional definitions of sites which are based on cursory examinations of the sites when they are first located, archaeologists introduce an unnecessary amount of noise into the archaeological record. Definitions such as these must be used with caution. It is for these reasons that site type was not taken into consideration during this study.

In this study I have suggested that the archaeological record of the Pine Parklands is best explained using the Co-Influence Sphere model of Syms (1977). The archaeological complexes which existed in the Pine Parklands represent groups of people who interacted with one another. This interaction was a major cause (although not the only cause) of the different patterns of land use seen for each of the various groups. For most of the last 11,000 years, the Pine Parklands was probably used as a secondary or tertiary resource area. Various cultural groups whose home territories, or core areas, were located elsewhere would move into the Pine Parklands for a given reason, stay a while, and then move on. The time of the heaviest utilization of the Pine Parklands was the period between 1000 B.C. and A.D. 1000, when at least five different groups of people used the area. These five groups included one, the One Bear Complex, which made this area its home. The other groups were only visitors. For the time following the disappearance of the One Bear Complex, the archaeological record is rather confusing and it is not possible to determine the nature of the occupation of this area.

The descriptions of land use patterns for the Pine Parklands presented in this study raise some questions about the use of predictive models in archaeology. As part of this study, a predictive model for site locations was developed for the Ashland Ranger District, and was tested using newly acquired survey data. Of the variables used to attempt to predict site locations, only slope and soil type were found to be useful for making predictions. Ecozones may be useful, however, more data are required before this can be confirmed or rejected. Further tests using these variables are necessary to determine if accurate predictions can be made and if those predictions are useful for project planning. A problem with this model (as with all such models) is that the predictions which can be made from it do not provide much detailed information about the ways in which the prehistoric inhabitants exploited this area. For example, according to the model, there is no relationship between distance to water and the presence of an archaeological site. However, during the Late Archaic Period, One Bear Complex sites are closely associated with water while Besant sites are distinctly located away from water. A predictive model can not identify, and in fact hides, changes through time.

A question which needs to be asked is why didn't the model work better? Several possible reasons exist, and these are problems which must be taken into consideration with all predictive models. One possible problem is that some past surveys, the results of which were used to develop this model, were inadequate. Different researchers approach surveys in different ways and this can result in problems when comparing the results of the various surveys (Schiffer 1987:346-353). An example would be less intensively surveying steep slopes or heavily wooded areas because the researcher did not think any sites would be located there. A problem similar to this when comparing survey results is the various definitions of "site" which exist (Plog et al. 1978:385-389). An archaeological feature which one researcher might define as a site could be defined as an isolated find by another researcher. This can lead to bias in the recorded archaeological record. Differences in visibility can also be a problem when comparing the various surveys (Pettigrew 1985).

An additional reason for why the model did not predict site locations more accurately is that the predictions were made based on patterns established over time and averaged for the District as a whole. Each group of people who lived in the area exploited their environment in different ways. Different factors were important to the different groups at various times. Such variations are not taken into consideration by the model and may lead to inaccurate predictions. In addition, these predictions are bound to be somewhat inaccurate because the model was based on patterns on the District as a whole, but tested on a small part of the District. There are bound to be inaccuracies when going from a broad scale view (the District as a whole) to a narrow view (the Schiller Fire Survey area). This is especially the case for an area such as the Schiller Fire Project area, which appears to be unusual when compared to the rest of the District.

A final possible reason for why the model was not more accurate is that the cultural environment was not taken into consideration. The Co-Influence Sphere Model of Syms (1977) describes how the distribution of sites in a given area will be influenced by the interactions between the various groups who created those sites. These interactions can not be incorporated into the model. Another aspect of the cultural environment which cannot be included as part of the model is how the people perceived the environment around them. This is something which is very important for understanding how people interacted with their environment (Binford 1983b:219-223; Thompson 1983). A trail would be another part of the cultural environment. Unless a trail was known to exist in a given area prior to a project, the presence of such a trail could not be included in the model and it is likely that this would affect the accuracy of the predictions made by the model.

This is not to say that predictive models are not useful. As a management tool to assist in cultural resources management, predictive models can be very powerful (Cordell and Green 1984; Kincaid 1988). The ability to use such a model will vary from region to region. For example, in the Southwest, large blocks of land can be designated as low probability areas (Cordell and Green 1984), while on the Ashland District, only small, non-contiguous blocks can be designated low probability. This results in a predictive model being less useful in the Pine Parklands when compared to the Southwest. La Point (personal communication 1990), however, suggests that it may be possible to deal with the mosaic environment and make accurate predictions using alternative approaches, such as Geographical Information Systems.

It is necessary, however, to raise a caution about the use of predictive models. Models can be very useful in the planning stages of a project. For example, on the Ashland District the model could be used to lay out the cutting units of timber sales in low probability areas. This would result (hopefully) in fewer sites being found in the sale areas and this would save money and allow the sales to proceed with a minimum of complications. The model could not, however, be used as a justification for not surveying the low probability areas. As Berry (1984:845) has noted "a misunderstanding of predictive modeling constitutes an outright threat to archaeological sites due to the potential use of such models as substitutes for clearance surveys . . . they simply cannot provide sufficient evidence to warrant the granting of archaeological clearance without benefit of field survey" (emphasis in original). Predictive models will always miss sites, and these unusual sites are potentially very important for understanding the subsistence-settlement system of the past inhabitants of the region.

This important data would be lost if a predictive model was used to write-off blocks of land without first conducting surveys.

As is always the case in archaeology, additional data is required to test the hypotheses presented in this study. Paleoenvironmental and paleodietary studies are necessary to provide the detailed, fine grained data needed to support or reject these hypotheses concerning land use patterns over time on the District. Further tests of the predictive model are necessary to test its accuracy and usefulness. This study provides a solid foundation upon which future work in the area can build.

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